December, 1944

THE FOUNDRY

FIFTY-THIRD YEAR

.....THE BEST CONTRACT IN THE WORLD

MUTUAL trust and confidence in the performance of accepted responsibilities gives value, above "stock-in-trade," to commerce.

We are resolved to continue a good-will business with our established customers, and invite new accounts in the same spirit.

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50%-75%-85%-90%
FERRO-CHROMIUM
FERRO-MANGANESE
BOROSIL - SIMINAL
• BRIQUETS •
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Ohio Ferro-Alloys Corporation
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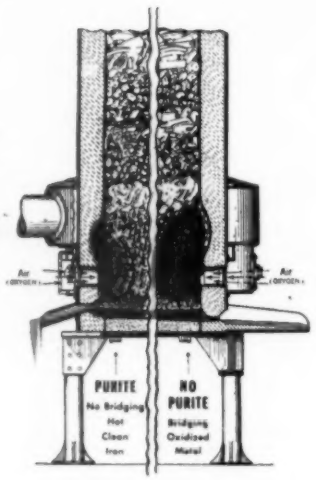
CHICAGO DETROIT PITTSBURGH SAN FRANCISCO TACOMA

SPEED PRODUCTION OF SOUNDER CASTINGS

PURITE restricts the combustion zone to a smaller, hotter area in front of the tuyeres, prevents bridging and reduces oxidation of the metal.



Purite is used with limestone in the ratio of 1 part Purite to 10 parts stone on the bed coke and 1 part to 20—40 parts stone on regular coke charges.

To insure sounder, better machining castings, use Purite

Refining with Purite, whether in the cupola or in a mixer ladle, purges the molten metal of oxides and silicates which produce sluggish iron, shrinkage and segregation defects.

Purite pays dividends in better cupola operations and cleaner stronger castings.

Can you afford to overlook this means of improving your competitive position in the castings industry.

THE SCIENTIFIC FLUX FOR BETTER MELTING AND CLEANER IRON

PURITE

THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42nd STREET, NEW YORK 17, N. Y.
(Licensee of Metallurgical Development Company, Inc.)

In Canada: Railway & Power Engineering Corporation, Limited

TECHNOLOGY DEPT.

The eyes have it

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DETROIT

Scene: One of the laboratories in the Bethlehem Steel plant at Bethlehem, Pa. Time: Almost any minute during a 24-hour working day. Business in hand: Determining the elastic limit of a sample of steel. Tester: Mrs. Mildred Kacar, who is a housewife when she isn't working in the laboratory.

It's a big and important part of the steel business, this testing. Working with chemicals and machines—operating controls, reading dials and studying columns of figures — heat treating, bending, etching, examining steel specimens. Important? The big Navy gun, which may be made from steel such as Mrs. Kacar is testing, just *has* to be right—beyond shadow of doubt.

In producing 13,000,000 tons of steel in a year, Bethlehem makes 5,000,000 chemical tests, 5,500,000 physical tests, and millions more of quality control tests. Every day, thousands of these tests are performed by women like Mrs. Kacar, who need no particular technical background to meet their responsibilities capably. At the other end of the scale, more complicated tests are performed by skilled technicians, steeped in such subjects as modulus, end-quench hardenability, and martensitic structure.

Throughout Bethlehem laboratories there's a healthy show-me attitude. Eagle eyes, waiting to be convinced, watch the tests—spark . . . hot-acid-etch . . . magnetic-particle . . . metallograph . . . spectrograph . . . radiograph . . . and many others.

The result is that the Bethlehem product, be it a huge slab of heat-treated armor or a humble one-inch-round bar, can be counted on to do the job for which it is intended.

WORLD'S LARGEST SHIPBUILDER

★ ★ BETHLEHEM STEEL ★ ★

SECOND LARGEST STEEL PRODUCER

Steel, Manufacturing and Fabricating Plants . . . Bethlehem, Steelton, Williamsport, Johnstown, Lebanon, Pottstown, Rankin, Leetsdale, Pa. . . . Buffalo, Lackawanna, N. Y. . . . Sparrows Point, Md. . . . Chicago, Ill. . . . Tulsa, Okla. . . . Corsicana, Tex. . . . South San Francisco, Los Angeles, Alameda, Calif. . . . Seattle, Wash. *Shipbuilding and Ship Repair Yards* . . . Quincy, Hingham, East Boston, Mass. . . . Staten Island, Brooklyn, N. Y. . . . Hoboken, N. J. . . . Baltimore, Sparrows Point, Md. . . . San Francisco, Alameda, San Pedro, Calif.

"Peace on Earth..."

Like everyone else we look forward to the time when that phrase will be a fact . . .

. . . when Green Bond will help you make civilian goods rather than tanks and guns and planes . . .

. . . when competition based on quality products replaces the "where-can-we-get-it" method of buying . . .

We repeat, we look forward to that day . . .

. . . when the high quality of Federal Green Bond (the best of the bentonites) becomes the prime reason for its purchase and use.

The future holds no fears for Federal Green Bond—a quality product!

DON'T SAY BENTONITE SAY GREEN BOND!

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

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THE FOUNDRY

for DECEMBER 1944

VOLUME 72 NUMBER 12

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London . . . . . 2, Caxton St. Westminster, S.W. 1.

THE FOUNDRY is published monthly by THE PENTON PUBLISHING CO., Penton Building, 1213 West Third Street, Cleveland, O. EARL L. SHANER, President and Treasurer; GEORGE O. HAYS, Vice President and General Manager; RUSSELL C. JAENKE, Vice President; FRANK G. STEINEBACH, Vice President and Secretary, and EDITH L. WERNER, Assistant Treasurer.

Subscription: In the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $2.00; three years, $5.00. Single copies 25 cents. Copies published three months or more previous to date of current issue, 50 cents.

Member: Audit Bureau of Circulations, Associated Business Papers, National Publisher's Association.

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Entered as second class matter at postoffice at Cleveland under the act of March 3, 1879.

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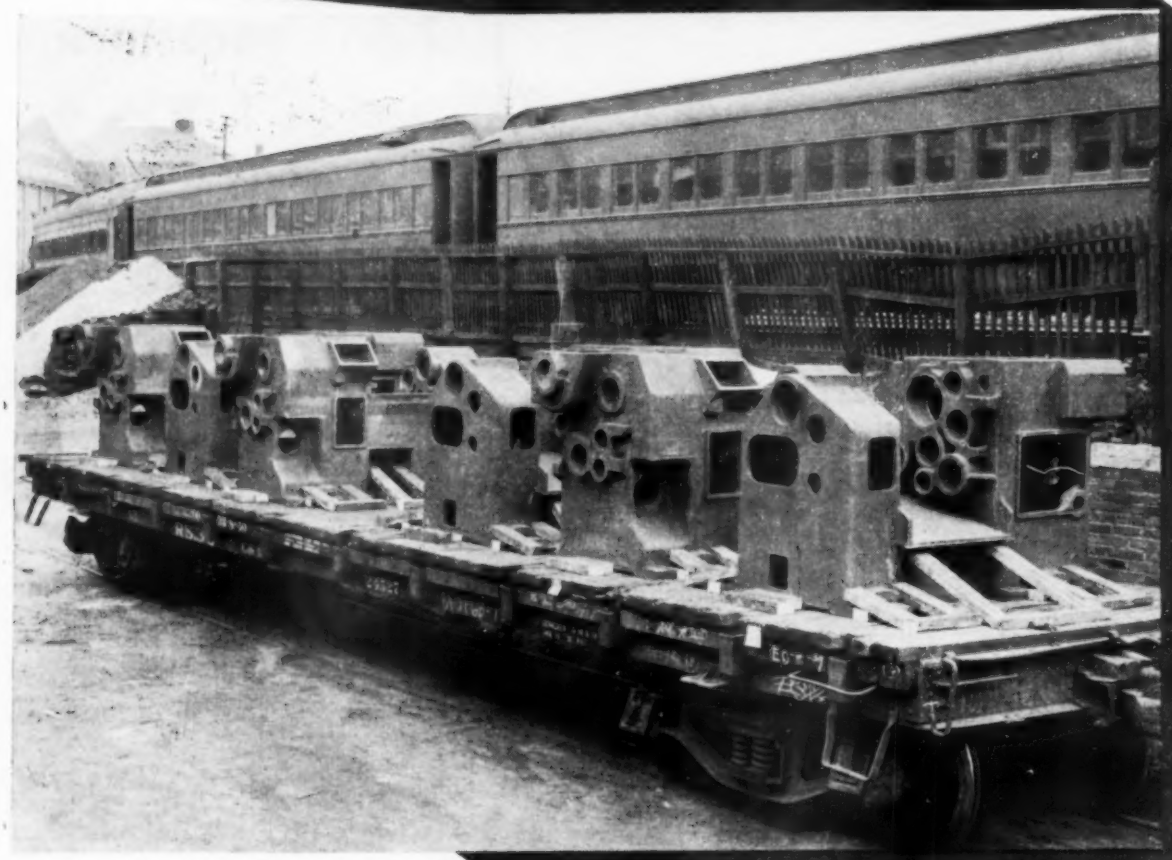
WAR CASTINGS

GOLDEN'S FOUNDRY & MACHINE CO. · COLUMBUS GA.



Single Purpose Lathe Beds for Turning 90 mm. Shells

Across the Chattahoochee River from Columbus, Ga., The Golden Foundry and Machine Company has been in large production of heavy castings for war needs. On the opposite page Wilson-Pirrie type steering engines made for the United States Maritime Commission are being assembled. Quadrant and tiller arm and overhead hand control assemblies will go on before shipment. The carload of 6,000-pound beds are for single purpose lathes—turning 90 mm. shells. There are 103 cores in this high-class casting job. Golden Foundry and Machine Company are old time Linoil users.

THE WERNER G.

(DIVISION OF ARCHER-

2191 WEST 110 STREET WOODBINE

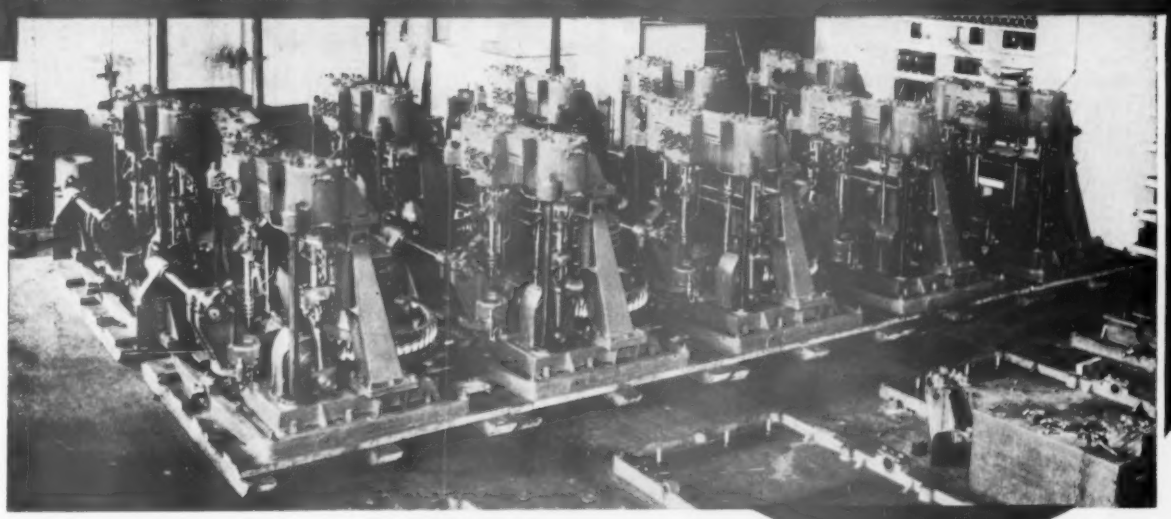
"We have used your core oil for many years and find it very satisfactory," writes Mr. Theo. E. Golden, Vice-President and Treasurer. That, we consider, is a pretty fair endorsement of Linoil. After all it is the foundrymen who have used Linoil for "many years" who are in position to judge, and when their verdict is "very satisfactory," what more could be asked. We need these long time users especially to prove the uniformity of Linoil. Every foundryman trying Linoil for the first time checks for himself on the tangible qualities that make Linoil the foundryman's

LINOIL

friend—the quick easy cleanout, the small percentage of blown or core-faulted castings, the perfection of the cores coming to the molders, the oven time, bench workability, and high sand ratio possible with Linoil; but for uniformity, the most important quality of all in core oil, the best evidence is the testimony of foundrymen like Mr. Golden, who have used Linoil for "many years."

Linoil is not a fancy-priced core oil but is a practical oil for practical men—practical in price as well as practical in performance. Order Linoil next time.

★ BUY WAR BO

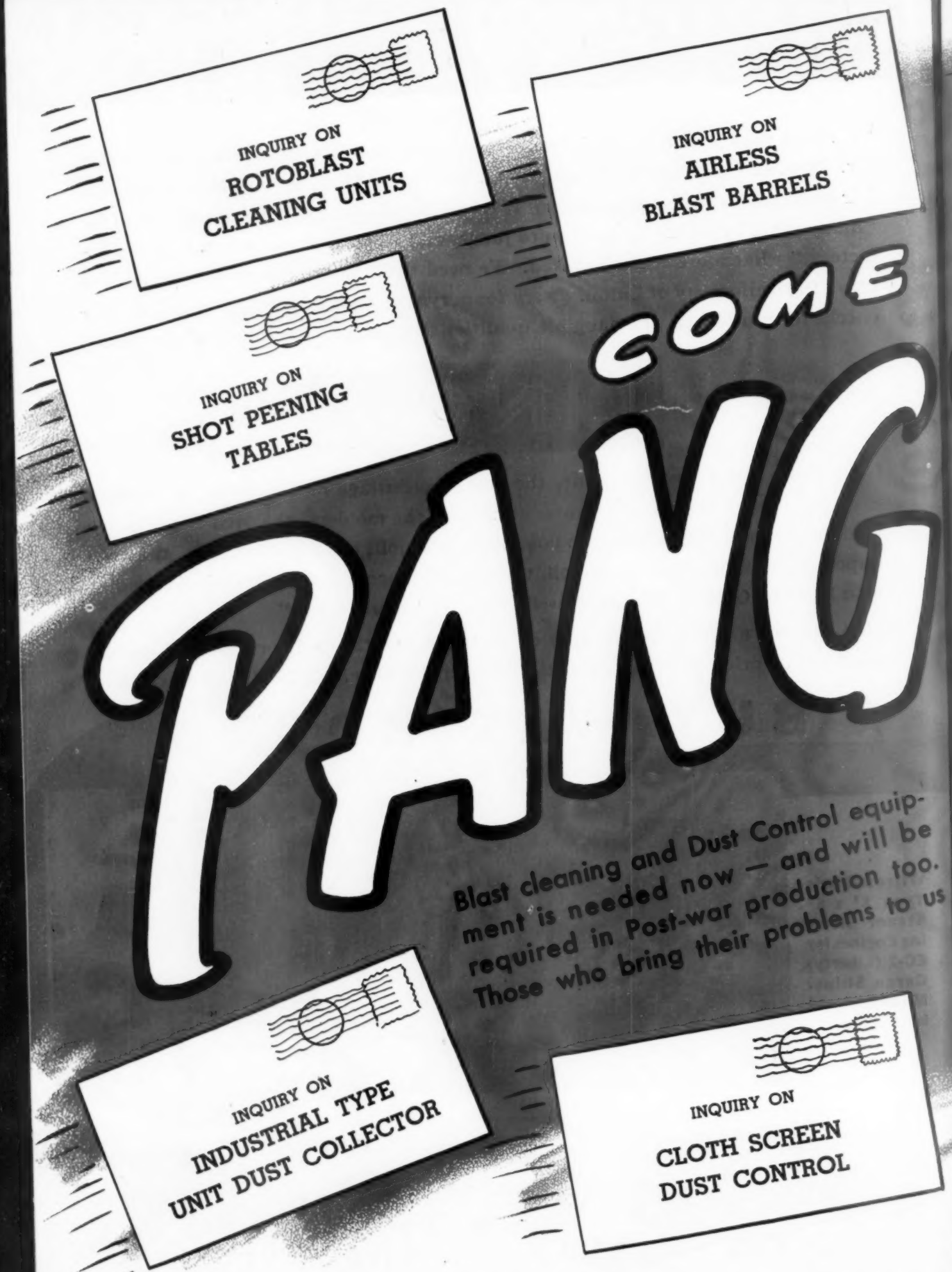


Wilson-Pirrie Type 8" x 8" Steam Steering Engines for EC-2 (Liberty) Cargo Ships. Manufactured by Golden.

SMITH COMPANY

DANIELS-MIDLAND COMPANY)

4690 CLEVELAND 2, OHIO


INQUIRY ON
ROTOBLAST
CLEANING UNITS
INQUIRY ON
AIRLESS
BLAST BARRELS
INQUIRY ON
SHOT PEENING
TABLES
COME
PANG
Blast cleaning and Dust Control equipment is needed now — and will be required in Post-war production too. Those who bring their problems to us
INQUIRY ON
INDUSTRIAL TYPE
UNIT DUST COLLECTOR
INQUIRY ON
CLOTH SCREEN
DUST CONTROL

INQUIRY ON
HYDRO BLAST
CASTING WASHERS

INQUIRY ON
AIR BLAST
CLEANING TABLES

TO
BORN

today — are the ones who do most to
help the war — and the peace.

"COME TO PANGBORN"

INQUIRY ON
SPECIAL BLAST
CLEANING MACHINES

INQUIRY ON
AIR BLAST
CABINETS

★
249

NSA
1944
ARMY
NAVY

PANGBORN CORPORATION

World's Largest Manufacturer of Blast Cleaning and Dust Control Equipment

HAGERSTOWN - - - MARYLAND

Champion Foundry and Machine Co.
extends to our host of friends in the great
Foundry Industry heartiest Christmas
greetings and sincerest good wishes
for the New Year 1944-1945

Seems but a brief period since Champion Foundry and Machine Co. extended our first Yuletide greetings to the industry which we have now served for nearly a half century.

Throughout the intervening years, during peace and war, we have placed our accumulated experience at the disposal of our friends who have contributed so much toward America's high standard of living and America's ability to withstand the threats and attacks of less favored, war-aggressor nations.

It is Champion's 46 years of experience and "know how" that has made Champion Core Blowers leaders in their field; a "must" in the modern foundry. These simple, sturdy, efficient tools provide the most economical method available for the production of uniformly accurate cores.

Today, Champions are doing their part to hurry the arrival of a just and lasting peace. Tomorrow, we hope before another year has passed, Champions will be earning greater peace time profits for the Foundry Industry through faster, more accurate, more economical production of cores for the manufacture of consumer goods.

Champion Foundry & Machine Co.

1318 W. 21st St., Chicago 8, Illinois

HANDLE FOUNDRY SAND EASIER

Save Manpower — Speed Production with P&H Single Line Grab Buckets

Hang a P&H Single Line Grab Bucket on a regular crane hook and it's ready for service. It works with any crane — without changes in cable reeving — without complicated hook-ups or switch-over delays.

You can whip your manpower problems in a hurry when P&H Single Line Grab Buckets are used for handling sand, refuse, and other foundry materials — for digging pits, filling flasks, etc. They break "bottlenecks" in handling and cut costs as well.

Time-tested features insure perfect balance. Equalized bowl operation results in a full bite at every bite. The P&H patented wedge action trip-lever feature prevents recoil, eliminating shock damage to bucket, cable, and entire hoisting unit. Simplified design and sturdy construction in every detail assure long trouble-free service.

Write for Descriptive Folder

Why P&H Single Line Grab Buckets excel in foundry service is demonstrated in Bulletin C-27, which shows how they are built and how they operate, and gives dimensional data. A copy will be sent on request—no obligation. *Write today.*

"Controlled Discharge"

Cranes for Cupola Charging

Included in the P&H line — America's largest builder of overhead materials handling equipment — are cranes and hoists that permit charging of cupolas at any level for better melting control. . . . Write for information.

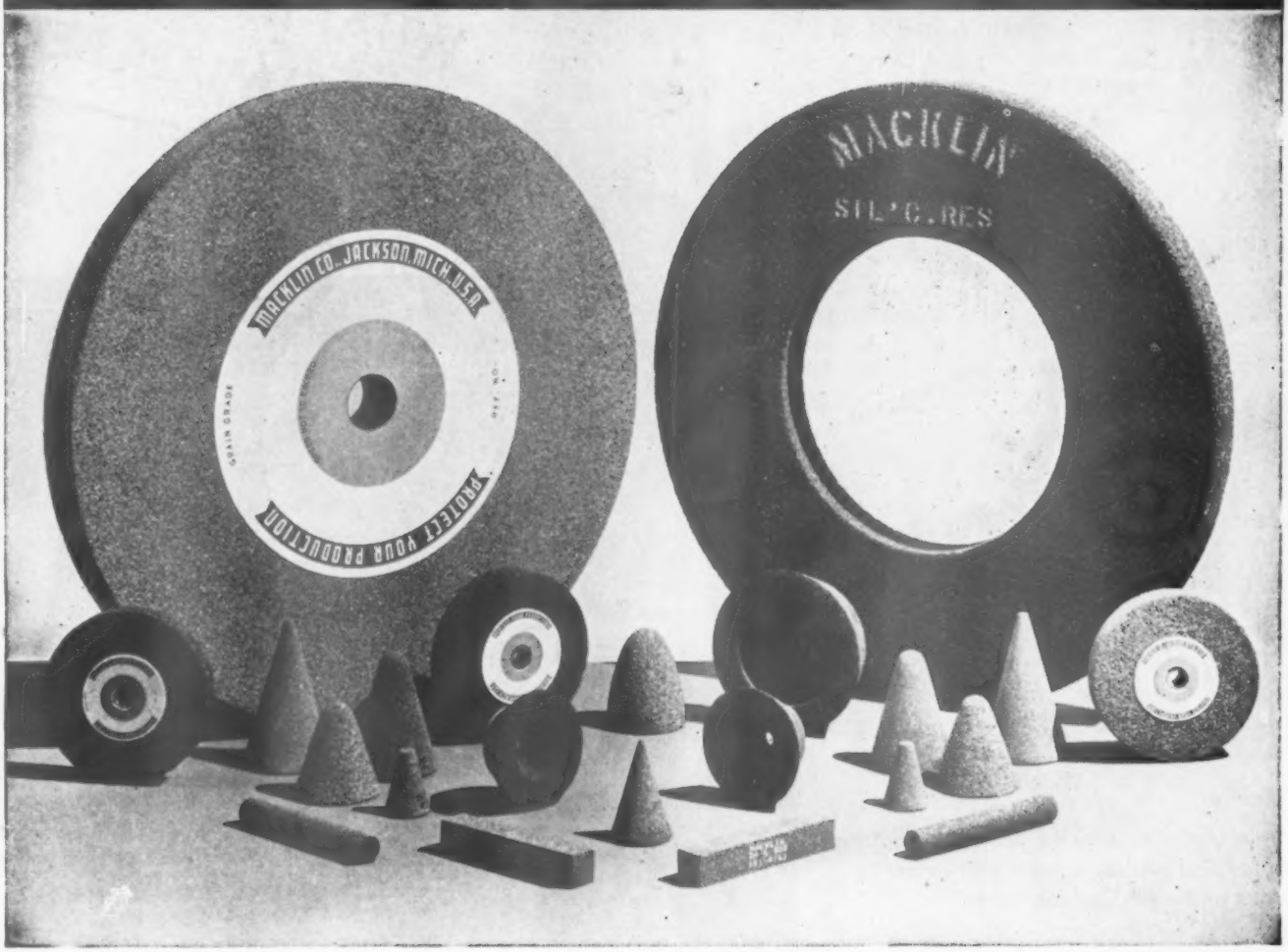
P&H SINGLE LINE GRAB BUCKETS

Gen. Off.: 4405 W. National Ave., Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

HOISTS · WELDING ELECTRODES · MOTORS · P&H · EXCAVATORS · ELECTRIC CRANES · ARC WELDERS

MACKLIN GRINDING WHEELS



FOUNDRIES, large and small, require grinding wheels in many sizes, shapes, grains and grade combinations.

Macklin Company is thoroughly equipped to produce high quality grinding wheels for all foundry requirements.

No matter what your grinding problems may be there is a Macklin wheel to fit the job that will "Protect Your Production."

Ask for the services of a Macklin Field Engineer.

Invest in War Bonds

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

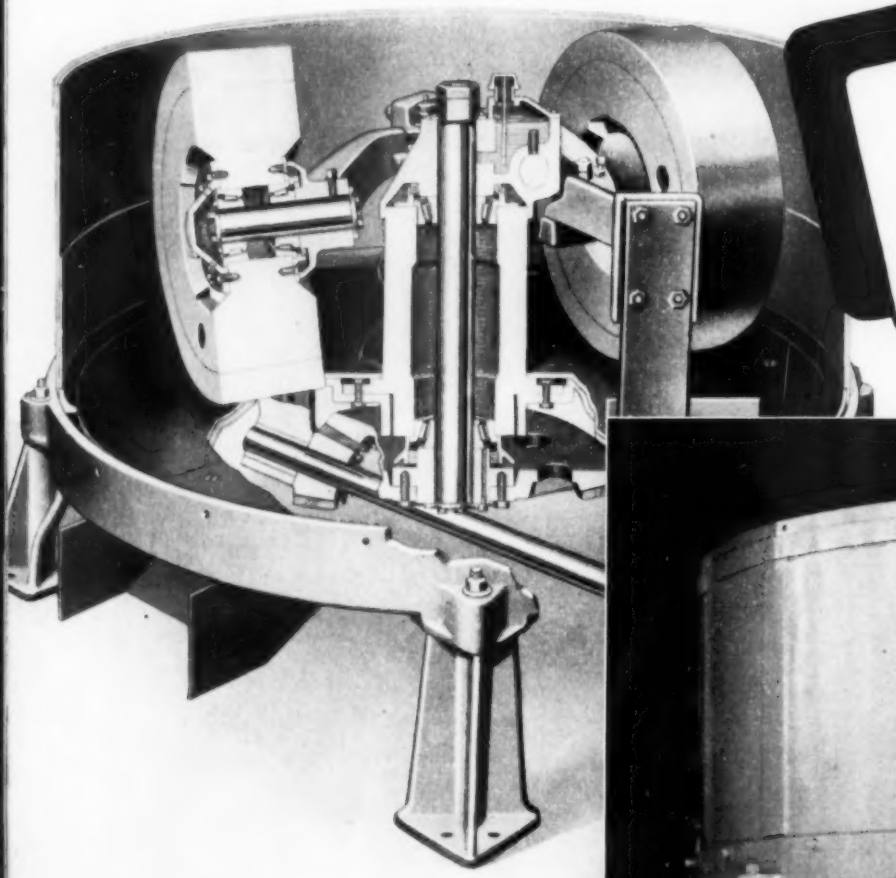
Distributors in all principal cities

Sales Offices:—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

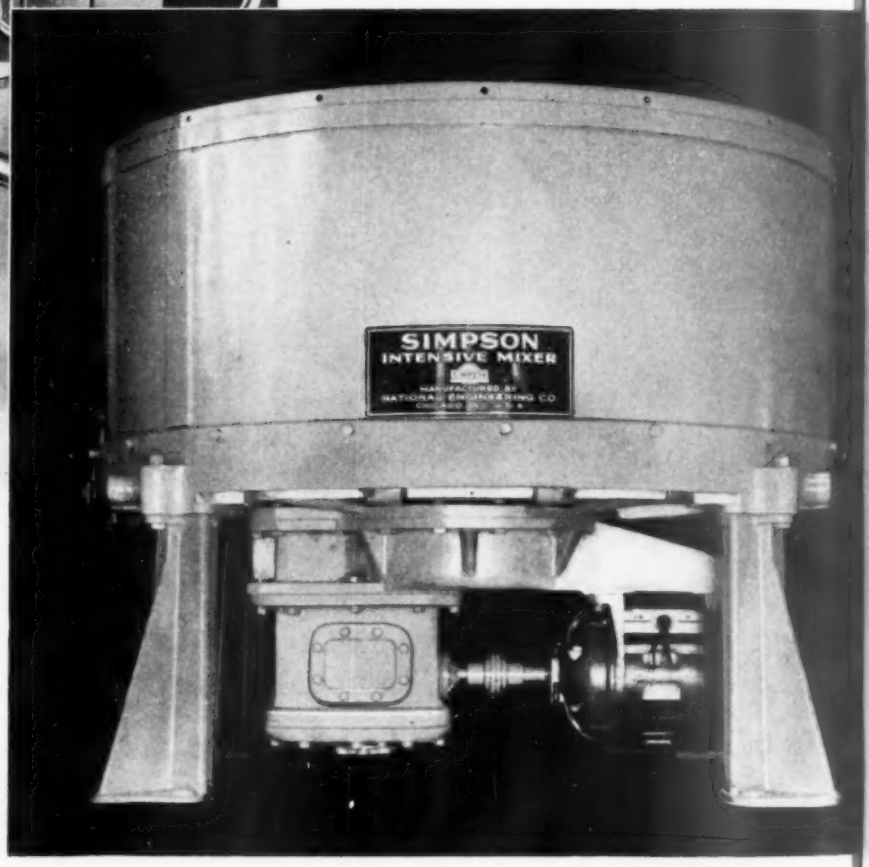
SIMPSON MIXERS the foundation

No. 5 of a Series

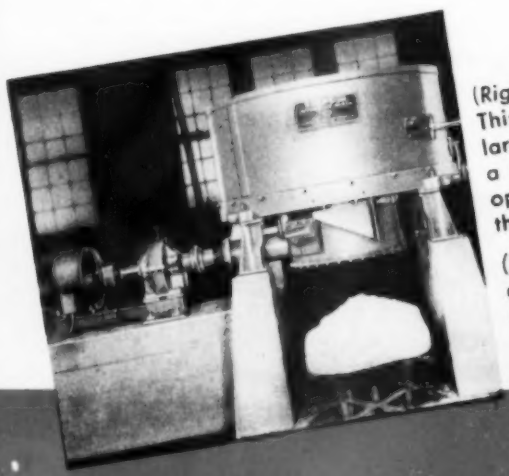
WHAT MAKES THE SIMPSON MIXER BETTER



(Above) This sectional drawing shows the anti-friction muller and vertical shaft bearings which are standard on larger Simpson models.



(Right) No. 3 Unit Drive Simpson Mixer with totally enclosed reduction unit and motor mounted on bedplate to eliminate foundations and save floorspace.



(Right) Proof of power economy! This No. 2 Simpson Mixer in a large steel foundry needs only a twenty horsepower motor to operate it in mulling batches of three-quarters of a ton of sand.

(Left) Where it is preferred, foundries can have the motor and speed reducer separate as it is on the No. 2 Simpson Mixer shown here.

# of better sand control . . .

Efficient Driving Mechanisms Low Power Requirements

. . . for smooth — low-cost, trouble-free operation

• We've taken a Simpson Mixer apart. We've explained each part in detail—to show how it fitted in to the whole to give better, faster sand conditioning.

But production and sand quality are just part of the story:— ***maintenance and operating costs must be kept at a minimum.*** So let's consider the Simpson efficient drive mechanism and power requirements as they affect operating costs.

The simple, modern drive arrangement used on Simpson Mixers provides a reliable, efficient power source with a minimum of maintenance. In most installations the motor and speed reducer unit are of the unit drive type, being mounted to the bedplate to save floorspace and eliminate building a foundation for them. They can be mounted separately however, where specific conditions make it necessary. On all the larger models, antifriction construction is used on the vertical shaft and muller arms to make them smooth operating, to lessen maintenance and to save power.

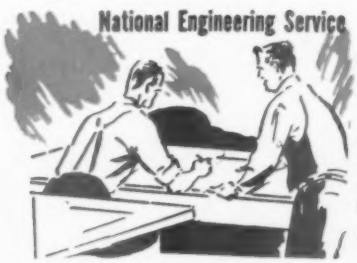
Another factor in reduced power costs is the Simpson operating principle. The fact that the mixer operates at a speed under 35 R.P.M., and that the entire pan and load are not revolved mean considerable savings in power.

Constant tests made by National Engineers prove that operating, power and maintenance costs are minimum . . . that with a Simpson you get properly prepared sand at the lowest net cost per ton. And this is, for sure, another chain in the link of evidence that says Simpson is the wise choice for every foundry sand conditioning job.

SAND CONTROL HANDBOOK

The new 64-page Simpson Handbook tells the complete story of better sand control. If you haven't a copy, we'll be glad to send you yours without obligation.

National Engineering Service



For more than 30 years National Engineering and Field Service, has helped hundreds of foundries solve problems in sand preparation, reclamation, handling, storage and control. Today, National Engineers are constantly on the job helping foundries with problems of sand handling and control on construction, maintenance, repair or new requirements. National Engineering and Field Service is available and eager to help you whenever and wherever you need it.

National Field Service

Our Army-Navy Production Award flag now has a white star for continued production achievement.

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Hanley, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

DELTA
CORE & MOLD WASH
FOR STEEL
Better finished castings at lower cost

DELTA
GRAKOAT
For Grey Iron, Malleable and Non-Ferrous Metals. Smoother surfaces . . . No gas

DELTA
THERMOKOAT
IT'S PLASTI-LASTIC
for all types of Metal Casting. Highest fusion wash available.

DELTA
SPRAY BINDERS
Produces dry sand finish on green sand molds.

DELTA
MUDDING COMPOUND
EBONY AND SLIKTITE
Smooths and seals joints to prevent gas leakage.

13 STAR PERFORMERS IN THE FOUNDRY FIELD

DELTA
BLACKOAT
For Grey Iron and Malleable
Mildly chemically active, produces slight surface chilling in contact with molten metal.

DELTA
NON-FERRUSKOAT A1-2-3 B-4
Chemically active washes for magnesium and aluminum castings. A distinct advancement in the science of core and mold wash development.

DELTA
CORE OILS
High Tensile, low gas, rapid drying

DELTA
NON-FERRUSKOAT
For excellent finish on all non-ferrous castings

DELTA
PARTEX
Nut Shell Parting
The modern lycopodium replacement.
Safe-non-hazardous

DELTA
NO-VEIN
COMPOUND
A scientifically developed sand-addition product to prevent excessive sand expansion which eliminates veining, penetration.

DELTA
SAND CONDITIONING
OILS
Only small quantity required to eliminate core sand stickiness in core boxes.

DELTA
LIQUID
PARTING
Low cost—
long lasting

For detailed information on the application and use of any DELTA Foundry Products write . . . .

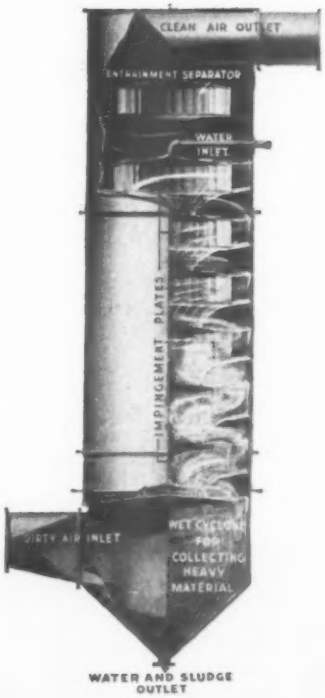
"DELTA OIL PRODUCTS CO. is a three time winner of the Army-Navy "E" award for excellence in production.

DELTA OIL PRODUCTS CO.

Manufacturers of
INDUSTRIAL & AUTOMOTIVE OILS, GREASES & COMPOUNDS
MILWAUKEE 9, WISCONSIN

Why Schneible Is The Peacetime Dust Collector

Many of America's grey iron, steel, malleable and non-ferrous foundries—large and small—production and jobbing—use Schneible systems. There's a size and type for every foundry.



There are definite reasons why foundries which have been installing dust collecting equipment which they expect to use in the postwar era have chosen Schneible Multi-Wash equipment in such great preponderance.

Schneible systems function continuously and indefinitely without attendance. No filters, screens or bags to clean or renew. Only water is used as the cleaning medium, and this water can be used over and over again. No bothersome accumulation of dust to dispose of; the collected matter, as sludge, permits easy disposal. Maintenance is minimized; no parts to break, burn, clog or rapidly wear. All elements within a Schneible collector tower (pictured) are stationary.

Complete dust removal, combined with trouble-free operation, has resulted in repeat orders from many widely known foundries. Clean air for all departments is provided at the lowest ultimate cost.

Dust control will continue to be a major foundry problem during the postwar period. Investigate Schneible Multi-Wash Equipment *now*.

CLAUDE B. SCHNEIBLE CO.

2827 Twenty-Fifth St., Detroit 16, Mich.

Engineering Representatives in Principal Cities

SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT
DUST COLLECTION ABSORPTION
CONDENSATION AND TEMPERATURE REDUCTION

GROWTH THROUGH *Distinguished Service* SINCE 1889

IN EVERY INDUSTRY there are those who pioneer—those who set out, through constant study, research and experiment, to chart the course of progress down which others follow.

Fifty-five years ago, the newly-founded Peninsular organization elected to be a pioneer in the grinding wheel industry. Since that time, Peninsular has originated and contributed many new and important advancements in the fabrication of abrasive wheels—in the machinery for their manufacture—in the methods for their application to modern manufacturing problems.

To accomplish this has not been easy. It has taken time—money—and endless striving. But it has brought its rewards. And chief of these is the steady, healthy growth that has brought the Peninsular Grinding Wheel Company to the position of leadership it enjoys today.

A STANDING INVITATION

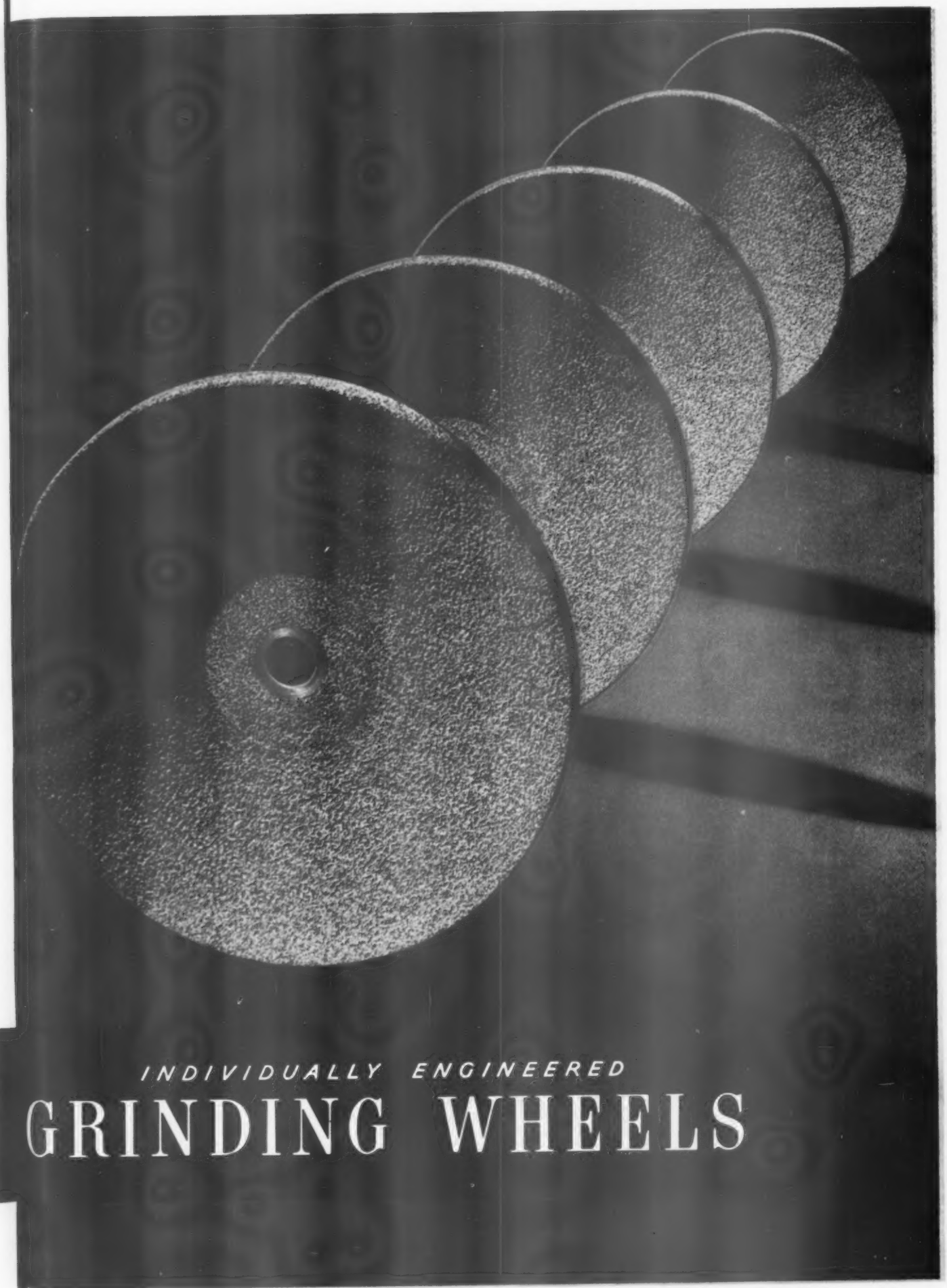
Our expert staff of factory and field engineers are ready today to help in your postwar preparation—with a production, engineering and cost analysis service beyond any offered up to now in the industry.

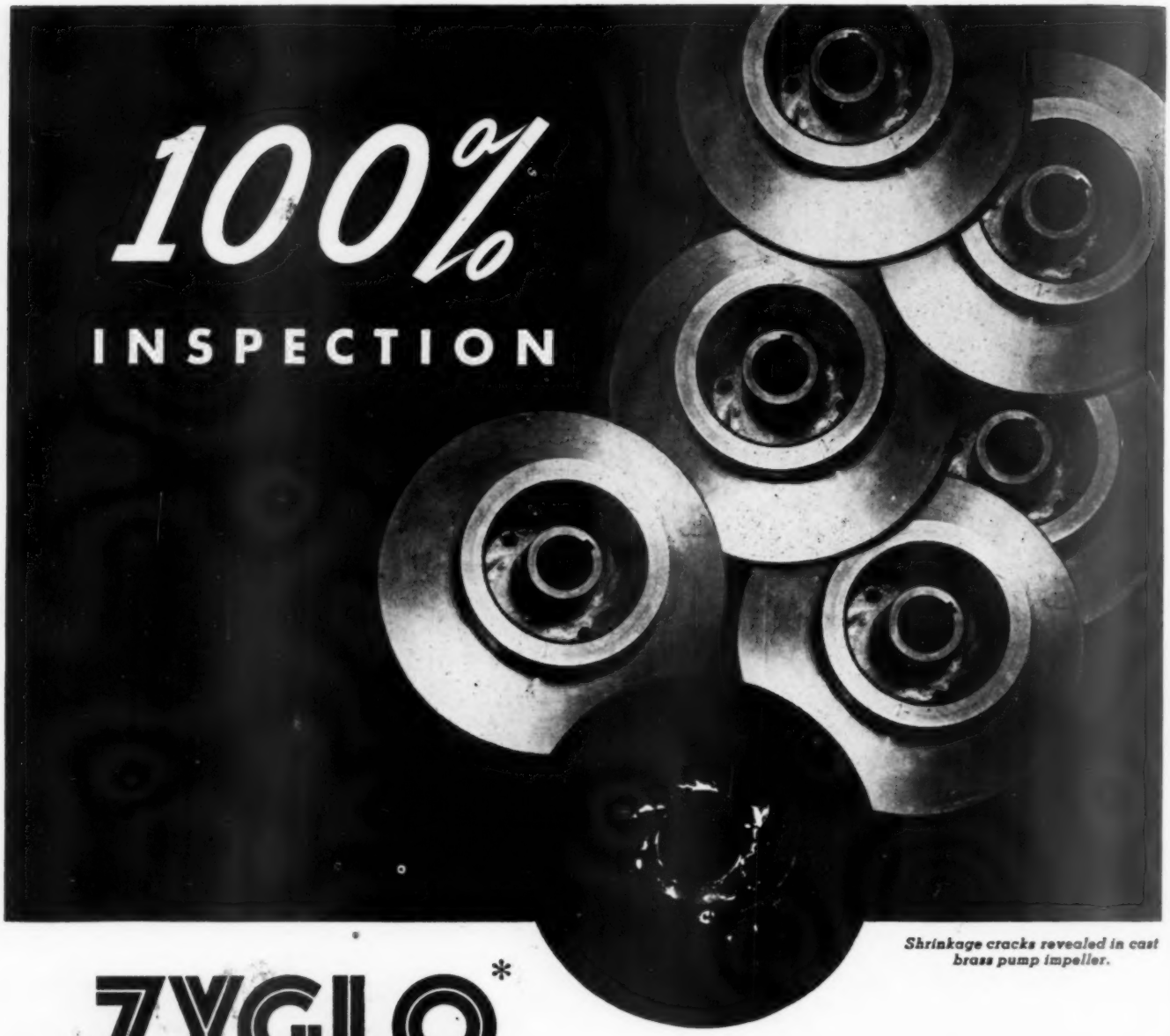
The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7, Michigan. *Branch Offices:* Chicago, Cleveland, Newark, Pittsburgh.

SPECIALISTS IN RESINOID BONDED WHEELS

PENINSULAR G

SINCE 1889


INDIVIDUALLY ENGINEERED
GRINDING WHEELS



Shrinkage cracks revealed in cast brass pump impeller.

ZYGLO*

BLACK LIGHT METHOD Permits Pre-Inspection for Flaws of Every Part in Production

Methods of parts inspection by "sampling" or inspecting random specimens cannot be expected to assure 100% flaw-free finished assembled products. Conversely it *can* be expected that 100% inspection—examining every part produced—will assure results closest to that ideal.

Zyglo allows 100% inspection in fields where it was not before possible or economical. Any solid material whether metal, glass, ceramic or plastic can be inspected.

Zyglo's brilliant fluorescent indications enable the rejection of parts susceptible to failure and also focus attention on the correction of production operations which cause the flaws.

Let us make an actual demonstration inspection of your product.

• • •

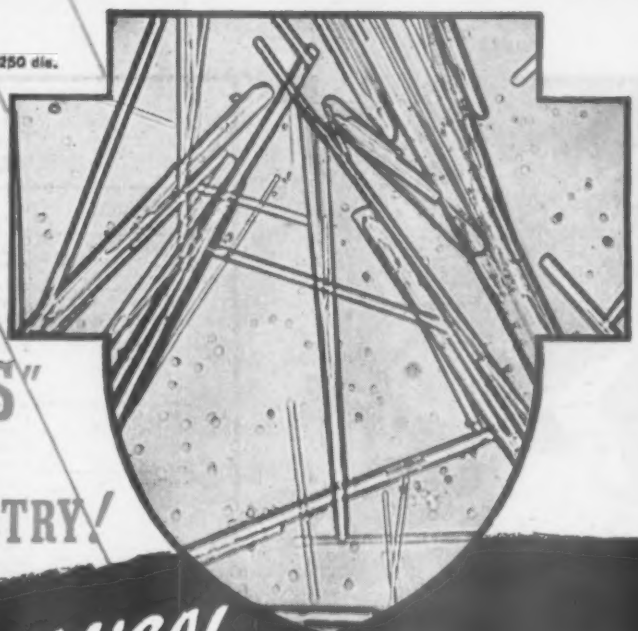
**ZYGLO—The Trade Mark of Magnaflux Corporation applied to its equipment, material and methods for fluorescent penetrant inspection.*

MAGNAFLUX CORPORATION

5918 Northwest Highway, Chicago

NEW YORK • DETROIT • CLEVELAND • DALLAS • LOS ANGELES

Growing crystals of lead fluoborate—250 dia.



NEW CHEMICAL "TOOLS" FOR AMERICAN INDUSTRY!

GENERAL CHEMICAL METAL FLUOBORATES

METAL FLUOBORATES

- Cadmium Fluoborate
- Chromium Fluoborate
- Copper Fluoborate
- Ferrous (Iron) Fluoborate
- Indium Fluoborate
- Lead Fluoborate
- Nickel Fluoborate
- Silver Fluoborate
- Stannous (Tin) Fluoborate
- Zinc Fluoborate

Alkali Group

- Ammonium Fluoborate
- Potassium Fluoborate
- Sodium Fluoborate

Many important products have been developed out of General Chemical's progressive research in fluorides. *Today*—its Metal Fluoborates command considerable attention as new chemical "tools" for electroplaters and metallurgists. *Tomorrow*—the unique properties of these versatile chemical compounds suggest many potential uses whose development is both a challenge and a promise of rich reward to research and industrial chemists interested in electrolytic and metallurgical processes.

ELECTROPLATING – Metal Fluoborates are supplied in a concentrated solution form. They require no time to dissolve and dilute quickly with water to the required plating strength! Laboratory tests and commercial applications indicate that the Metal Fluoborates have other outstanding advantages for electroplating, such as high anode and cathode efficiency, good conductivity, high concentration and ease of operation at room temperature.

At present there is a widespread acceptance of lead fluoborate plating baths and an ever-growing use of lead-tin, tin, zinc, cadmium, indium, copper and other Metal Fluoborate solutions.

METALLURGY – Magnesium and aluminum casting has opened a field where alkali fluoborate salts are extremely important. All these salts may find acceptance as fluxes for welding and soldering such metals as silver, gold, stainless steel, nickel, etc. Their further use by metallurgists for heat treating, hardening and other processes can be expected with new developments in the light metal field.

Indium and Lead Fluoborate Give Airplane Bearings Longer-Wearing Surfaces.

Metal Fluoborates Efficient in Barrel Plating, too.

Alkali Fluoborates Important in Magnesium and Aluminum Casting.

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta • Baltimore • Boston Bridgeport (Conn.) • Buffalo • Charlotte (N. C.) • Chicago Cleveland • Denver • Detroit • Houston • Kalamazoo (Mich.) Kansas City • Milwaukee • Minneapolis • New York Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis Utica (N. Y.) • *Pacific Coast Technical Service Offices:* Los Angeles • San Francisco • Seattle, Wenatchee, Yakima (Wash.)

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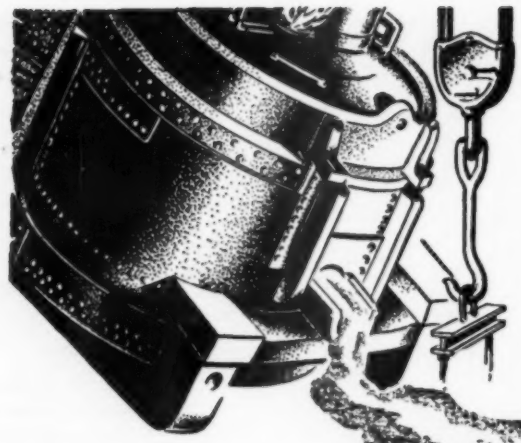
FIRST IN FLUORIDES

JUST RELEASED!

Important new research data on General Chemical Metal Fluoborates. Includes plating with Lead, Tin, Zinc and Cadmium Fluoborate, etc. Ask for Technical Service Bulletin No. 1015-A.

Copies on request from: Nearest Technical Service Office or General Chemical Company, Fluorine Division, 40 Rector Street, New York 6, N. Y.



THERE'S "Teem"-work AHEAD!

VANCORAM

FERRO ALLOYS AND METALS FOR PEACETIME PRODUCTS

Foundries must satisfy the voracious appetite of global war for metal implements and weapons to be used by our fighting forces . . . and afterwards for peacetime products. Castings made with alloyed irons and steels must meet the highest metallurgical requirements.

The correct choice of such alloys is of vital importance to obtain the properties required for the job. To many foundries, that means Vancoram Ferro Alloys or Metals.

Design trends and new applications will call for increased use of reliable alloyed steels and irons. When next you are faced with any problem involving the application of alloys, a member of our Metallurgical Staff is readily available for consultation or advice. VANADIUM CORPORATION OF AMERICA, 420 Lexington Ave., New York 17, N. Y.

VANCORAM BRAND

FERRO ALLOYS AND METALS

VANCORAM ALLOYS

PRODUCTS	NOMINAL COMPOSITION	APPLICATIONS
ALSIFER	Aluminum....20% Silicon.....40% Iron.....40%	Used principally as a steel deoxidizer and for grain size control.
GRAINAL ALLOYS Vanadium Grainal #1	Vanadium....25% Titanium.....15% Aluminum....10% Boron.....0.20%	Practical and economical intensifiers for controlling and increasing the capacity of steels to harden, and for improving other important engineering and physical properties. For the varying requirements of the trade three grades are available.
Vanadium Grainal #8	Vanadium....13% Titanium.....20% Aluminum....12% Boron.....0.20%	As above.
Grainal #79	Titanium.....20% Aluminum....13% Zirconium.....4% Manganese....8% Boron.....0.50% Silicon....5% max.	As above.
FERRO-CHROMIUM High Carbon Grade	Chromium..68-70% Carbon.....4-6%	For wrought constructional steels and steel and iron castings.
Iron Foundry Grade	Chromium..62-68% Carbon.....4-6% Silicon.....6-9%	For alloyed cast irons. Readily soluble as a ladle addition at the lower temperatures of cast iron.
Low Carbon Grades	Chromium..67-72% Carbon .06%, .10%, .15%, .20%, .50%, 1.00%, and 2.00% max.	For low carbon chromium steels—especially those with high chromium content, such as stainless and heat resistant types.
FERRO-SILICON 25-30% Grade	Silicon....25-30%	Deoxidizer for open hearth steels; also for high silicon, corrosion-resistant iron castings.
50% Grade	Silicon....47-52%	Used extensively in steel making, both as a deoxidizer and for the addition of silicon to the steel. Pulverized form used as ladle addition to cast irons for silicon content and graphitization control.
75% Grade	Silicon....74-79%	For high content silicon steels . . . principally sheets and forgings of high magnetic permeability, high electrical resistance and low hysteresis for electrical apparatus.
High Silicon Grades 80-85% 85-90% 90-95%	 Silicon....80-84.9% Silicon....85-89.9% Silicon....90-95%	For high content silicon steels where small ladle additions are used for required silicon content. Also for manufacture of hydrogen by reaction with caustic soda.
FERRO-TITANIUM High Carbon Grade	Titanium...15-18% Carbon.....6-8%	Final ladle addition to control "rimming" action and cleansing of effervescing steel. Final deoxidizer and scavenger for steel castings and fully killed ingot steels.
Low Carbon— 40% Ti Grade	Titanium...38-43% Carbon. 0.10% max. Silicon..4.00% max. Aluminum 8.00% max.	Alloy addition to high chromium corrosion resistant steels, where smaller ladle additions are desired and low aluminum is not essential.
Low Carbon— 20-25% Ti Grade	Titanium...20-25% Carbon. 0.10% max. Silicon..4.00% max. Aluminum 3.50% max.	For high chromium corrosion resistant low aluminum content steels. Deoxidizer for some casting and forging steels.
FERRO-VANADIUM Grade "A"— Open Hearth	Vanadium...35-40% Silicon.. 12% max. Carbon. 3.50% max.	For low percentage Vanadium content of rolled, forged or cast constructional steels. Also used in Vanadium cast irons.
Grade "B"— Crucible	Vanadium...35-45% Silicon..3.50% max. Carbon. 0.50% max.	For tool steels and special steels containing high percentages of Vanadium, in which required limits for carbon and silicon are narrow.
Grade "C"— Primos	Vanadium...35-45% Silicon..1.25% max. Carbon. 0.20% max.	For tool steels and special steels requiring high percentages of Vanadium and exceptionally low carbon and silicon content.
Special grades of Ferro Vanadium and Vanadium Metal up to 95% available for special requirements.		
VANADIUM PENTOXIDE Technical Grade— Fused Form	V_2O_5.....90%	A source of Vanadium in basic electric furnace steels. A base for numerous chemical compounds.
V-FOUNDRY ALLOYS V-5 Grade	Chromium..38-42% Silicon.....14-16% Manganese..8-11%	Ladle addition for cast irons. Reduces chill, promotes uniformity of structure, increases strength and hardness.
V-7 Grade	Chromium..28-32% Silicon.....15-21% Manganese..14-16%	As above.
GRAPHIDOX NO. 4	Silicon.....45-50% Titanium....9-11% Calcium.....5-8%	New alloy for the graphitization of iron; ladle treatment insures iron with normal graphite, free from dendritic structure; reduces chill; efficient inoculant in the production of high strength irons.

AFTER 20 YEARS, ROYERS REPLACE ROYERS

In the large foundry of Babcock-Wilcox and Goldie-McCullough, Ltd., Galt, Ontario, two Royer Sand Conditioners and Blenders were recently retired after 20 years service. Two Model "NC-2" Royers, one of which is pictured, were installed in their place. The user writes:

"Because of the excellent service given by the old Royer machines, there was no question in our minds about replacing them with new Royers.

"The operations in the foundry are such that one machine is not sufficient to service the whole shop. The Royers are used exclusively in our grey iron foundry for conditioning the heap sand. The only other sand conditioning machine used is a muller-type mixer for making facing sand. The range of castings made is from one-half pound on squeezer machines to ten and twelve tons.

"The main advantage of the Royer machines to us is the speed with which the machines thoroughly mix, condition and aerate the sand, with the consequent saving in manpower required for sand mixing."

This case demonstrates that Royers not only provide properly conditioned sand with less labor, but also that they are built for long-time service under the toughest foundry operating conditions. No wonder over 6,200 Royers are now in use.

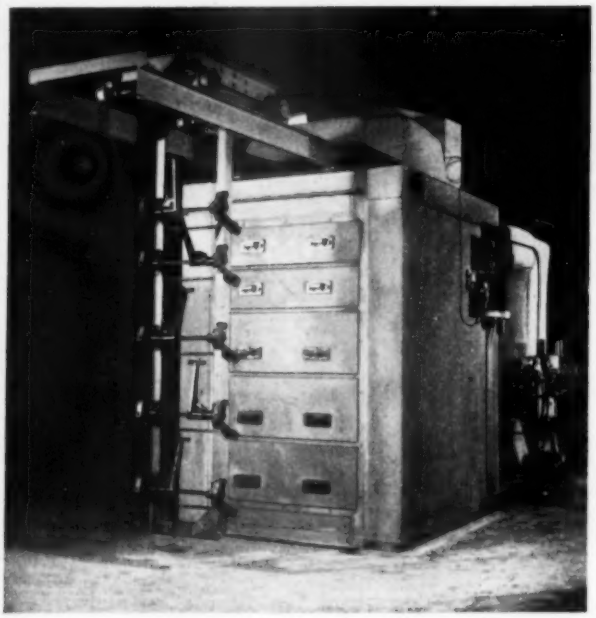
There's a Portable or Stationary Royer for every foundry. Send for new Catalog 744.

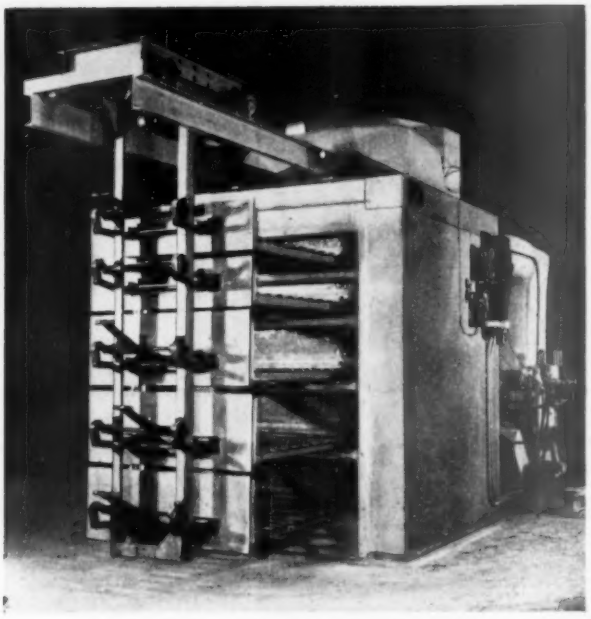
THE ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

FOREMOST IN SAND CONDITIONING EQUIPMENT

New Improved

ROLLING DRAWER OVEN





BY CARL-MAYER

A new, improved, convection, gas fired, recirculating, rolling drawer oven. 5′ wide x 6′ 4″ long x 7′ 3″ high. 5 drawers 36″ wide x 48″ long with drawer heights of 10″ and 5″ deep. Operation of drawers is entirely selective, each drawer being furnished with individual operating equipment. One or more drawers may be simultaneously opened.

Generally used for core baking in foundries but can be used for all types of drying. Ovens of this type were recently installed for Aluminum Co. of America, and for one of the foremost Foundry Research Institutions in the country.

Let us help you in planning the best oven for your core baking requirements. Write for our recommendations or ask for Bulletin #141.

THE CARL-MAYER CORP. • 3030 Euclid Ave., Cleveland, Ohio

Core and Mold Ovens . . . All Types . . . All Sizes

PORTABLE · SHELF · RACK · CAR · CONVEYOR · ROLLING DRAWER

SERVING CONCERNS LIKE *these:*

Aluminum Co. of America
American Magnesium Corp.
American Radiator & Standard Sanitary Corp.
Babcock & Wilcox Co.
Battelle Institute
Bridgeport Brass Co.
Bucyrus-Erie Co.
Brown Industries Inc.
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Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
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United States Steel Corp.
Whiting Corp.

$6^{3}/_{5}$ - - 2 x $16^{1}/_{5}$!

That equation was proved by results. A prominent malleable iron foundry requested us to improve their existing equipment.

They had . . .

←

This car with 18 cast stands of boxes, each stand weighing 1800 lbs., producing 12 tons of malleable castings during each heating cycle.

Then . . .

We specified and installed P. S. (for Pressed Steel) The same car as above, but with 22 stands of our new sheet alloy boxes, each stand weighing but 600 lbs.

The Results

This new P. S. installation produces regularly 26 tons of malleable castings during the same cycle as used with the old equipment. In plain words, 6 3/5 tons of P. S. sheet alloy boxes are producing over twice as many castings as 16 1/5 tons of the old equipment produced in the same time.

P. S. (for Pressed Steel) has been making this new type of sheet alloy box since 1931. Our experience brought us this job, as well as countless others in the field of lightweight, highly efficient carburizing and heat treating equipment. Wire or write your specifications.

THE PRESSED STEEL COMPANY

of WILKES-BARRE, PENNSYLVANIA

BRANCH OFFICES: 312 Curtis Bldg., Detroit; 606 Nicholas Bldg., Toledo; 1915 Engineers Bldg., Chicago; 51 E. 42nd St., New York; 1005 Sterling Bldg., Houston, Texas; A & M Accessories Ltd., 19 Melinda St., Toronto, Canada; Broad St. Station Bldg., Philadelphia

PRESSED STEEL COMPANY PRODUCTS: Carburizing and Annealing Boxes, Thermocouple Protection Tubes, Seamless Steel Cylinder Caps, Seamless Steel Neck Rings, Welded Alloy Tubing for High Temperature and Corrosive Applications, Radient Tubes, Inner Covers and Base Sheaths for Steel Mills

CARRY CORES UP TO 1200 LBS. WITHOUT DEFLECTION!

Note the reenforcing construction used on this typical large plate. The arc welded frame gives rigidity, strength and eliminates deflection.

IT IS BEING DONE ON DIAMOND REENFORCED STEEL CORE PLATES

These special core plates are designed to carry large cores up to 1200 lbs., cores of any size, without deflection or warping.

You may obtain Diamond Core Plates to suit your own special requirements. They are furnished with or without perforations and in all smaller, standard sizes—plain or reenforced as indicated by your needs.

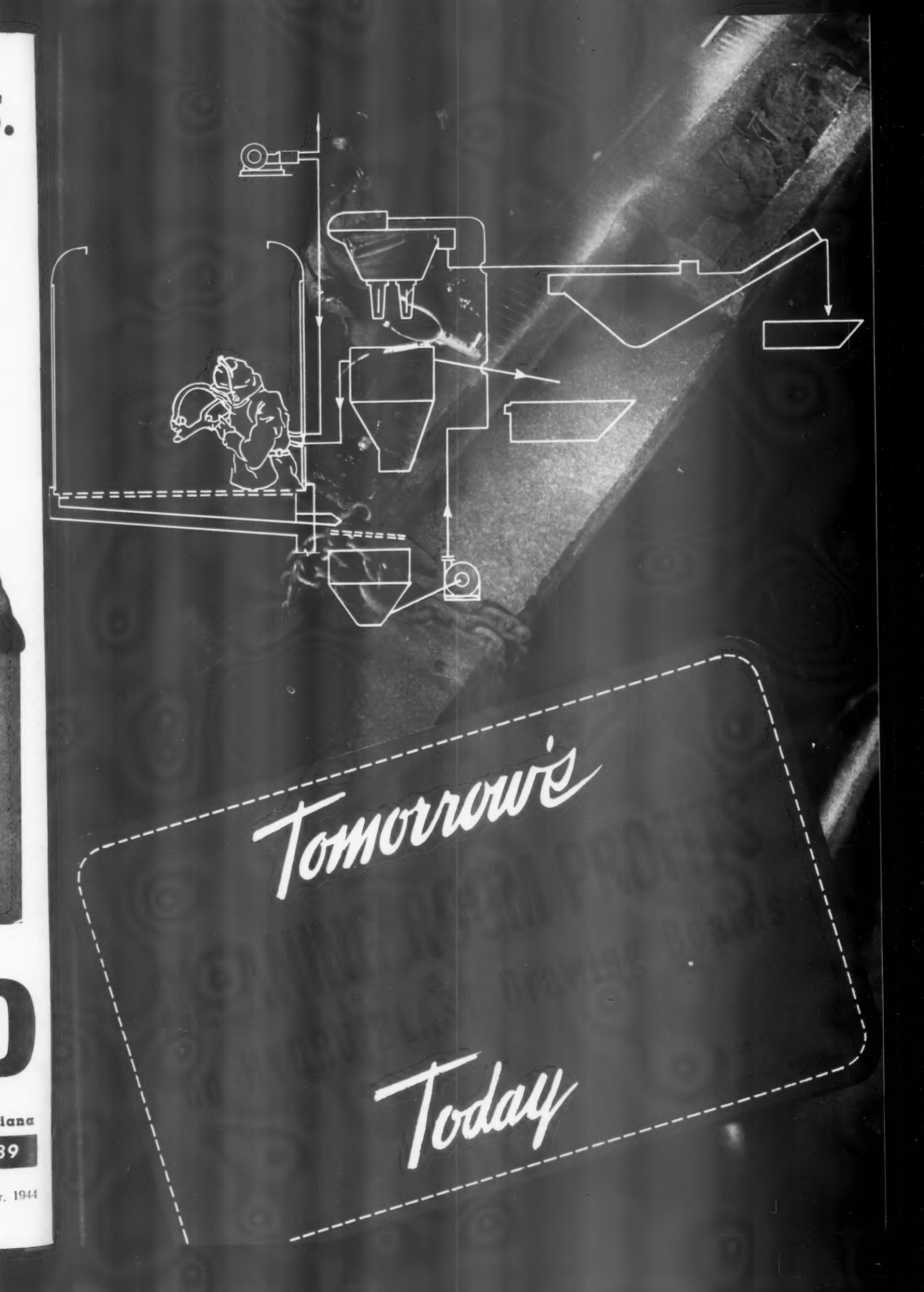
Send us detailed information on your core baking problem and we'll be glad to design a plate to handle the job. Weight of core and dimensions, in particular.

DIAMOND

CLAMP AND FLASK COMPANY

Telephone 2553 **Richmond, Indiana**

Designers of CORE PLATES, JACKETS, BANDS, FLASKS since 1889


Tomorrow's
Today

60 Hydro-Blast Installations are Saving

The Hydro-Blast Method is basically a modern means of knocking out cores and cleaning castings faster and better than the age-old conventional way of digging the cores out with bars, chisels, shakeouts and air hammers.

Castings are moved into the Hydro-Blast room directly from the mold so that in one operation and one handling the Hydro-Blast operator removes the core with core rods undamaged, cleans the surface and sand blasts the casting.

No Dust Is Created. Hydro-Blast provides vastly improved working conditions by reason of the dustless cleaning operation and by the fact that dust laden air created in other foundry operations is cleaned by the Hydro-Blast which draws this dust-laden air into the Hydro-Blast room by convection currents. The velocity of the stream of sand and water (three miles per minute) is more than sufficient to wet out micronic particles that are washed into the sewer.

The Hydro-Blast System can be designed to recover and recondition an average of 85% of the sand formerly dumped and return it for reuse in better than new condition.

The stream of water and sand expelled by the Hydro-Blast gun removes all sand in the cores and on the casting surface. This sand and the sand and water from the gun are then washed through the floor grating for tramp metal recovery, sand classification and removal of sludge which is the only waste material produced in the Hydro-Blast System.

Three-fold Hydro-Blast Efficiency. The effectiveness of the Hydro-Blast System is three-fold.

1. It saves man power because each Hydro-Blast operator replaces from four to nine men over the old methods of core knockout and casting cleaning.
2. It reconditions for reuse approximately 85 per cent of the sand previously discarded.
3. It not only makes no dust but reduces the existing dust hazard in the entire cleaning room.

TYPICAL SAVINGS BY HYDRO-BLAST

Magnesium and Aluminum Foundries With Sand Recovery Systems. This installation is designed to reclaim 9000 tons of sand per year, or approximately 30 tons per day. Transportation of new sand to this foundry now is about 400 miles.

The savings afforded are:

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	266	82,992	
After Installation	40	12,449	
TOTAL CAR MILES SAVED	226		70,543

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	110	34,320	
After Installation	24.5	7,644	
TOTAL MAN HOURS SAVED	85.5		26,076

This installation is designed to reclaim 31,200 tons of sand a year. The new sand purchased now is hauled approximately 340 miles to the foundry.

The savings after erection of the Hydro-Blast System are noted below:

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	755	235,560	
After Installation	113	35,334	
TOTAL CAR MILES SAVED	642		200,226

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	190	54,280	
After Installation	35	10,920	
TOTAL MAN HOURS SAVED	155		43,360

This installation is designed to reclaim 30,000 tons of sand per year. Transportation of new sand to this foundry is approximately 83 railroad miles.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	177	55,224	
After Installation	26	8,112	
TOTAL CAR MILES SAVED	151		47,112

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	190	59,280	
After Installation	20	6,240	
TOTAL MAN HOURS SAVED	170		53,040

This survey is based upon the Hydro-Blast Cleaning System and the necessary equipment to recover 100 tons of sand per day. Transportation of new sand to this foundry will probably average 400 railroad miles.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	888	277,056	
After Installation	133	41,558	
TOTAL CAR MILES SAVED	755		235,498

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	308	96,096	
After Installation	46	14,352	
TOTAL MAN HOURS SAVED	262		81,744

This survey is based upon the recovery of 90 tons of sand per day which approximates 425 miles of rail travel for its delivery. The savings in man hours noted in next column include the Hydro-Blast Cleaning System.

Man Hours, Transportation and Sand

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	850	265,200	
After Installation	127.5	39,780	
TOTAL CAR MILES SAVED	722.5		225,420

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	252	78,624	
After Installation	40.50	12,636	
TOTAL MAN HOURS SAVED	211.50		65,988

This survey is based upon the Hydro-Blast Cleaning System and the recovery of 75 tons of sand per day which is now hauled some 296 miles to the foundry.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	493	153,909	
After Installation	74	23,086	
TOTAL CAR MILES SAVED	419		130,823

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	205	63,960	
After Installation	32.25	10,062	
TOTAL MAN HOURS SAVED	172.75		53,898

Gray Iron Foundries With Sand Recovery Systems. This survey is based upon the recovery of 30 tons of sand per day. The new sand purchased would have to be transported approximately 335 miles.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	223	69,576	
After Installation	33	10,436	
TOTAL CAR MILES SAVED	190		59,140

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	174	54,288	
After Installation	40.5	12,636	
TOTAL MAN HOURS SAVED	133.5		41,652

This survey is based upon the recovery and reuse of 7,300 tons of sand per year. Sand which is now hauled approximately 286 miles to the foundry.

The savings noted below include the Hydro-Blast Cleaning System.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	143	46,395	
After Installation	22	6,959	
TOTAL CAR MILES SAVED	126		39,436

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	267.3	83,397	
After Installation	52.50	16,380	
TOTAL MAN HOURS SAVED	214.8		67,017

Besides the direct savings of man power using the Hydro-Blast Cleaning System, this survey reports on the reclamation of 5800 tons of sand per year. This sand is now transported approximately 432 miles to this foundry.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	178	55,680	
After Installation	27	8,362	
TOTAL CAR MILES SAVED	151		47,328

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	233	72,696	
After Installation	50.7	15,818	
TOTAL MAN HOURS SAVED	182.3		56,878

This survey is based upon the Hydro-Blast Cleaning System and the recovery of 5750 tons of sand per year, now hauled approximately 587 miles to the foundry.

TRANSPORTATION—car miles

	Per Day	Per Year	
Before Installation	240	74,983	
After Installation	36	11,247	
TOTAL CAR MILES SAVED	204		63,736

MAN POWER—man hours

	Per Day	Per Year	
Before Installation	383	119,496	
After Installation	178.7	55,754	
TOTAL MAN HOURS SAVED	204.3		63,742

WHAT 10 HYDRO-BLAST SYSTEMS ARE ACCOMPLISHING

We have summarized below the savings in sand transportation and manpower accomplished by Hydro-Blast for 10 foundries in the United States.

TRANSPORTATION

Savings in rail car miles using the Hydro-Blast System
Per Day 3,606.5 Per Year 1,119,262

MAN POWER

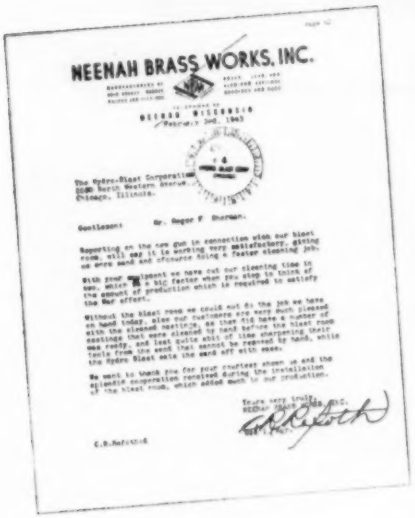
Savings in man hours using the Hydro-Blast System
Per Day 1,775 Per Year 553,995

The Hydro-Blast System of sand reclamation and casting cleaning was pioneered eight years ago. The first four years were spent in research and development. The last four years have witnessed an acceptance of this system by the foundry industry until today there are more than sixty installations in operation in the United States, Canada and England.

THE HYDRO-BLAST CORPORATION

2550 N. Western Avenue *Chicago 47, Illinois*

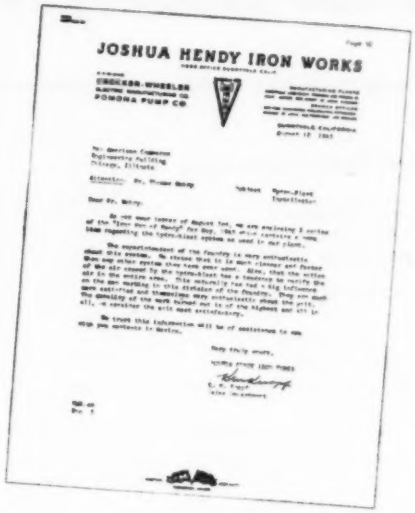
HYDRO-BLAST PRAISED BY MANAGEMENT AND LABOR


NEENAH BRASS WORKS, INC.

The conventional three gun Hydro-Blast casting cleaning unit has been operating in this plant for more than a year.

We quote in part from the May, 1943 "Iron Men of Hendy" house organ.

"By a process of sump-tanks, washing and automatic classification Hydro-Blast reclaims up to 85% of the casting sand for reuse by mixing half and half with new sand. The mixture is superior to fresh sand, too, for the reclaimed sand retains some of the original binder, necessary for good molds. Astonishingly, the device also serves as an air conditioner, for it draws in dry dust laden air from the plant, moistening and cooling it."


JOSHUA HENDY IRON WORKS

GRAY IRON

(Hydro-Blast Cleaning)

This company is now operating the conventional Two Gun Hydro-Blast System and reclaiming 40 tons of sand per day. Transportation of new sand to this foundry would approximate 286 rail miles.

TRANSPORTATION—Car Miles

	Per Day	Per Year	
Before Installation	254	79,248	
After Installation	38	11,856	
Total Car Miles Saved	216		67,392

MAN POWER—Man Hours

	Per Day	Per Year	
Before Installation	240	74,880	
After Installation	120	37,440	
Total Man Hours Saved	120		37,440

STEEL

A report on the Hydro-Blast installation at this company came to our attention in April, 1941. During the year 1936-1937 previous to the erection of Hydro-Blast, 36,000 tons (655 cars) of sand were hauled by rail approximately 700 miles to this foundry.

TRANSPORTATION—Car Miles

	Per Day	Per Year	
Before Installation	1,794	560,000	
After Installation	269	84,000	
Total Car Miles Saved	1,525		476,000

GRAY IRON

When Greenlee Bros. & Co. build their special machine tools for more production of aircraft engines, they depend upon their one gun Hydro-Blast installation to clean the castings to microscopic cleanliness.

We quote a statement from Mr. F. E. Rundquist, foundry manager, February, 1943. "While we have by no means reached peak production with our Hydro-Blast, we are recovering 10 to 15 tons of Sand every 16 hours and have reduced our purchases of new sand to half our former requirements.

"Replying to your request for information on sand-reclaiming in connection with the Hydro-Blast, the following is our present practice.

We are reclaiming an average of 200 tons of sand per week which covers our needs for facing sand for both dry sand and air dried molds for steel.

The original new sand is obtained from Millville, New Jersey and was formerly thrown away requiring from 10 to 20 mile one way haul to permissible dump.

The new sand including initial delivery cost plus unloading plus disposal cost ran from $6.00 to $6.50 per ton.

This sand is being reclaimed at a cost of $.75 per ton covering labor and maintenance cost but not including depreciation on equipment.

The reclaimed sand is being used as a direct substitute for the new sand and we are rather proud of the surface that we are getting on our steel castings."

The Hydro-Blast installation in this plant is for the recovery and reconditioning of used foundry sand only.

"As you know, we have a Hydro-Blast unit for washing sand installed at the plant, and Mr. Den Breejen was of considerable assistance to us in working out our sand problems. As a result of the washer, we have cut the consumption of new sand for the plant approximately 85%, thus making quite a saving in the amount of sand required to be shipped in and also the waste sand to be shipped out."

GRAY IRON

This Hydro-Blast installation has been in operation for five years and has shown approximately the following savings for each year of operation. Rail transportation of new sand about 160 miles.

TRANSPORTATION—Car Miles

	Per Day	Per Year	
Before Installation	266	82,992	
After Intsallation	40	12,449	
Total Car Miles Saved	226		70,543

MAN POWER—Man Hours

	Per Day	Per Year	
Before Installation	578	180,000	
After Installation	144	45,000	
Total Man Hours Saved	434		135,000

STEEL

The Hydro-Blast installation in this foundry consists of the conventional Two Gun Cleaning System with Sand Recovery at the rate of 33 tons per day. This sand had to be transported approximately 200 miles before erection of Hydro-Blast.

TRANSPORTATION—Car Miles

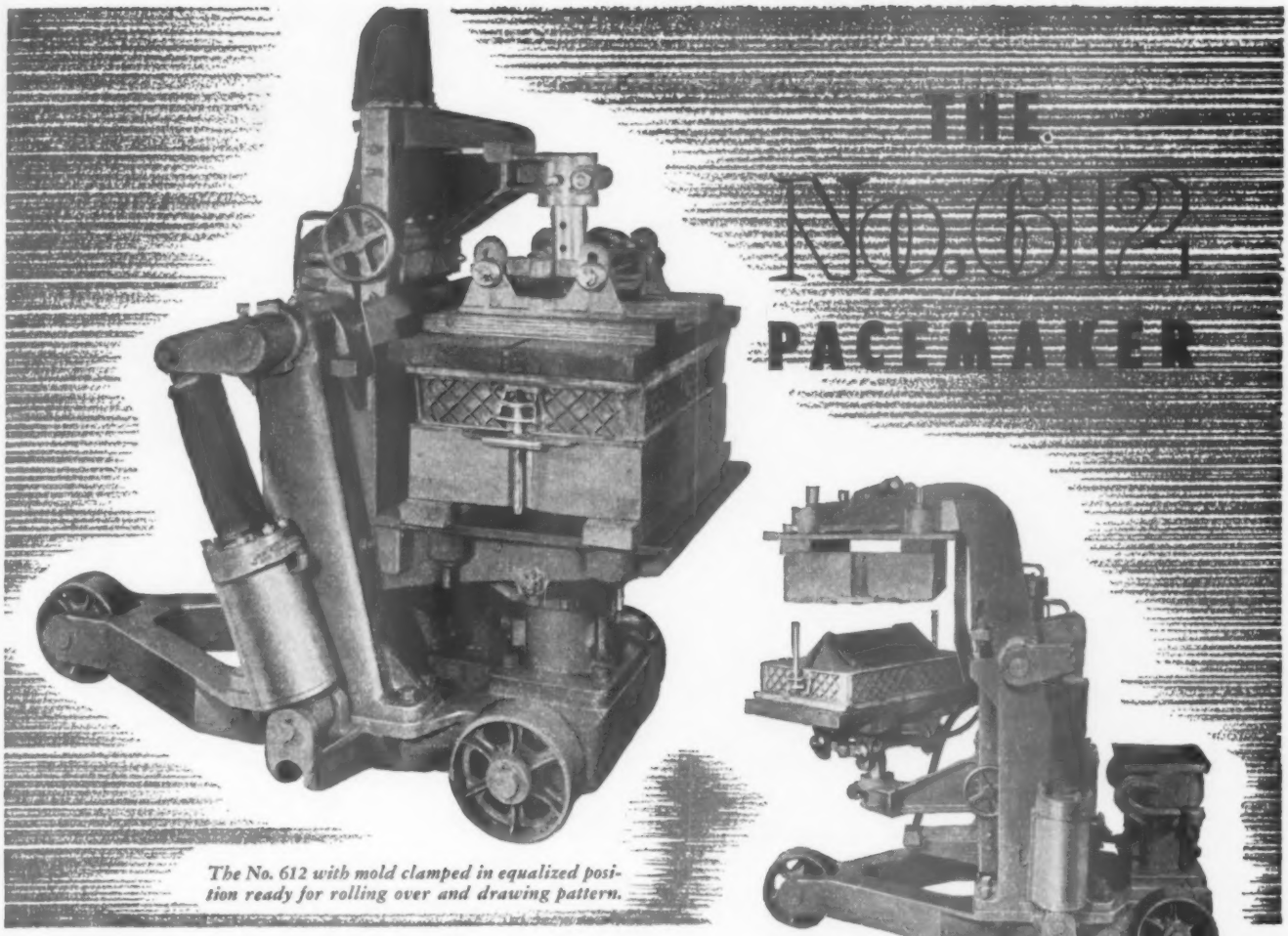
	Per Day	Per Year	
Before Installation	146	45,552	
After Installation	22	6,833	
Total Car Miles Saved	124		38,719

MAGNESIUM and ALUMINUM

"Hydro-Blast Equipment purchased to clean 300,000 pounds of Magnesium castings per month is now cleaning 450,000 pounds. We may clean 650,000 pounds per month before the season is over. (1944) It is impossible to get a production finish and the internal cleanliness of passages without the Hydro-Blast System."

HYDRO-BLAST CORPORATION

2550 N. Western Avenue **Chicago 47, Illinois**



The No. 612 with mold clamped in equalized position ready for rolling over and drawing pattern.

The No. 612 machine, rolled-over, showing the flask drawn from the pattern.

...For Work Requiring Absolute Accuracy in Ramming and Drawing

★ Newly introduced, this No. 612 portable, jolt, roll-over pattern draw machine is specially designed to meet present day foundry specifications . . . is ideally used in making the intricate cores and molds required in the aircraft and other precision industries.

This machine features an automatic air-operated clamp and equalizer. It is of open-end construction and is easily adjustable for flasks and core boxes of various sizes and heights. The No. 612 has a positive valve-less jolt, free from vibration and rebound, and two roll-over cylinders with oil dash pot control that assures smooth uniform operation.

Our fully descriptive catalog giving complete details of this and other Johnston & Jennings Molding Machines furnished gladly. Send for a copy.

THE JOHNSTON AND JENNINGS CO.

3667 ADDISON ROAD • CLEVELAND 14, OHIO

A COMPLETE LINE PROVEN IN SERVICE INCLUDING—

PLAIN AIR JOLTS
in 12 different sizes

JOLT SQUEEZERS
fast sturdy machines—3 sizes

JOLT STRIPPING PLATES
4 sizes ranging up to 16" draw

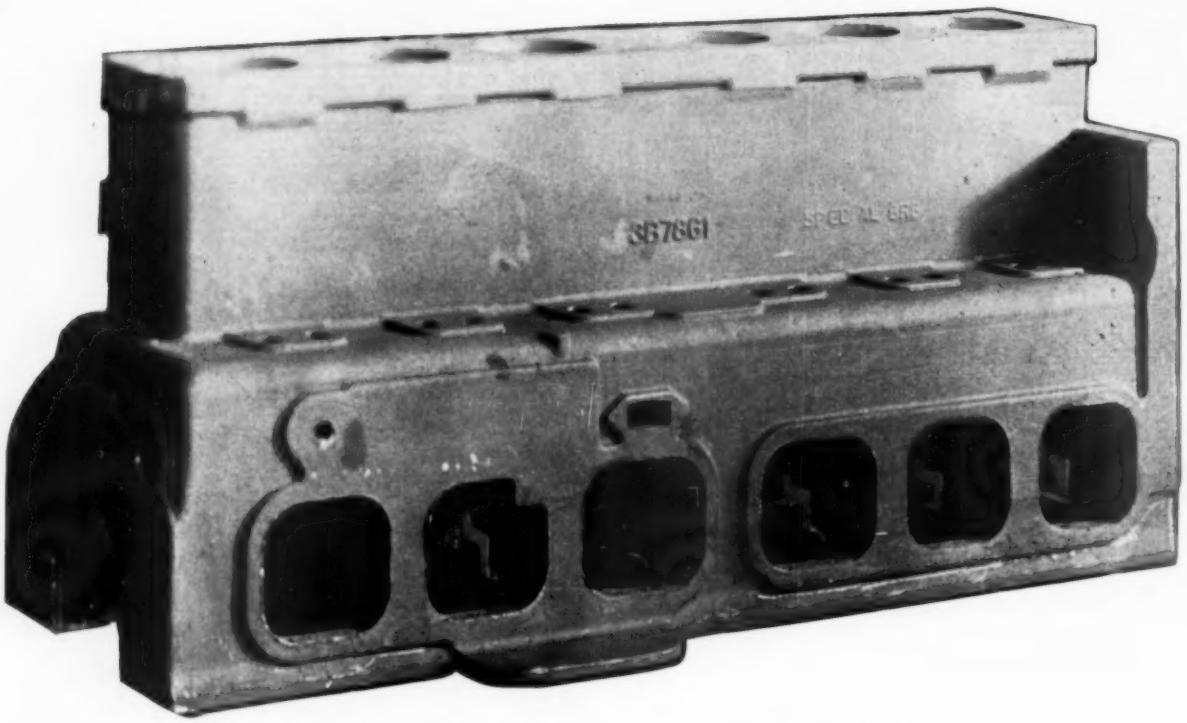
JOLT, SQUEEZE, STRIPPING PLATE AND PATTERN DRAWS
Popular for medium service —2 sizes

PORTABLE JOLT ROLL-OVER AND PATTERN DRAW
A heavy duty thoroughly dependable machine—portable

JOLT ROLL-OVER AND PATTERN DRAWS
Fast large capacity machines with roll-out conveyors—4 sizes

Write for fully descriptive catalog giving complete specifications.

VULCAN GREEN SPRAY



for modern motor blocks

VULCAN GREEN SPRAY produces the best surface and is the most economical material for insulating skin dried molds.

Its performance has been proven on many production lines making various types of Diesel and motor castings.

APPLIES WELL — NO SHORTAGE — PROMPT SHIPMENTS — LOW COST

MANUFACTURED ONLY BY

J. S. McCormick Company

25th St. and A. V. R. R.

Pittsburgh (22) Pa.

NOW IS THE TIME TO PLAN POSTWAR FOUNDRY NEEDS...

It won't be long, and streams of motor cars will again be "burning up" the highways. At the same time, the "go-ahead" signal will be given to the production of farm equipment, home appliances, office and factory machines, etc., etc.

To alert foundry men, all this means serious consideration should be given NOW to postwar foundry requirements. Take molding machines, for example. Are your present molders modern, high-speed machines? Are they capable of turning out peak production at a minimum operating cost?

Before buying new molding machines, be sure to investigate the dependable MILWAUKEE line. There's a model for every molding requirement, each one engineered to keep pace with the postwar demand for high speed production of quality castings.

MILWAUKEE *ARM-TYPE* JOLT SQUEEZE STRIPPER

Here is a typical MILWAUKEE molder, built to close tolerances for maximum production at minimum maintenance cost. Requires fewest jolts, affords maximum penetration of squeeze, maintains parallel squeeze at all times. All major working parts fully enclosed. Write for a set of bulletins.

MILWAUKEE Foundry Equipment Co.

2238 W. PIERCE STREET MILWAUKEE 4, WISCONSIN, U. S. A.

1944

Research Leadership Back of Every Ingot

The spectrographic department at Apex carefully measures the ranges of alloying elements of every heat of metal by the use of the densitometer. Such close laboratory control guides the removal of harmful elements and permits meeting the most exacting alloy specifications. This pre-testing of alloys is an important part of Apex Leadership Back of Every Ingot.

APEX SMELTING

Company • *Chicago 12, Illinois*

PROTECT "all hands"

. . . *with* AO ASBESTOS GLOVES

Made of the finest grade asbestos material, AO "Sturdy Weave" asbestos gloves and mittens ward off fire and heat . . . let a man work in *comfort.* The gauntlet style is easy to put on, yet is cut to cling closely to the sleeves, preventing sparks and metal from burning hands or arms.

Give your foundrymen a chance to work more comfortably and efficiently. Give them AO asbestos gloves and mittens. Call in your nearest AO Representative for complete information.

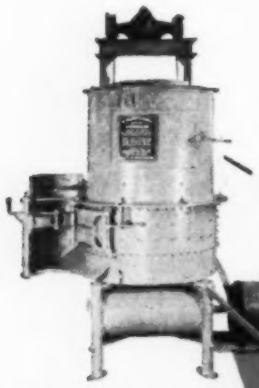
American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

Branches in all Principal Industrial Centers

NOW! A PORTABLE MULLOR...



The Speedmullor...recognized by foundrymen as the fastest, most efficient mulling method. Sand is squeezed, kneaded, and aerated between plows and rubber-covered rolls.

Top section of the Mulbaro which embodies the *proved* mulling action of the Speedmullor.

HERE'S a really versatile mulling unit for *your* foundry. Yes, it's portable . . . the initial cost and operating cost are extremely low . . . it provides an all-purpose mullor for small foundries and meets the mulling needs for special small batches in larger foundries.

The Mulbaro is comprised of 2 sections . . . top section contains the mulling mechanism which lowers down onto the portable mulling bowl that contains the sand to be mulled.

THE MULBARO...

MULBARO VERSATILITY ILLUSTRATED . . . FOLLOW THIS SEQUENCE OF OPERATIONS!

1 Sand to be mulled is shoveled into the Mulbaro's portable bowl. The bowl tips forward, permitting easy shoveling of sand.

2 The filled bowl is wheeled into position under the mulling unit. Perfect balance and rubber tired wheels enable one man to easily move filled bowl over the roughest foundry floors.

INCORPORATING A *Proved* MULLING METHOD!

3 Mulling mechanism is then lowered into operating position on the bowl by means of a hoist.

4 Sand is quickly and thoroughly mulled. Plows and rubber-covered rolls squeeze, knead, and aerate the sand.

5 Upon completion of mulling cycle, mulling mechanism is raised and sand wheeled away. Another bowl filled with sand is ready for mulling.

.. LOW COST...VERSATILE MULLING UNIT!

The Mulbaro assures sand prepared to your individual specifications. Cleaner, better finished castings are the result!

An extremely important feature of the Mulbaro is its ability to handle a large variety of sand without contamination from one batch to another, thereby eliminating a great deal of cleaning. As soon as one batch is mulled, another bowl can be placed under the mulling elements for immediate mulling. Two, three, or even more portable bowls can be used to advantage. The batch can remain in the bowl or bowls as a means of storage until it is all used. The low cost of the bowls makes it economical to have a number of them ready for use.

The Mulbaro's capacity is 3 cubic feet—the motor is 2½ H. P., available in A.C. or D.C. and all voltages, cycles, and phases with the exception of 110 volt and single phase. Entire unit—mulling mechanism, motor, and portable bowl is only $895 . . . separate bowls are $95 each. All prices F. O. B. Chicago.

ONLY $895
F. O. B. CHICAGO

Get complete information, engineering data, and specifications on the Mulbaro. Write today!

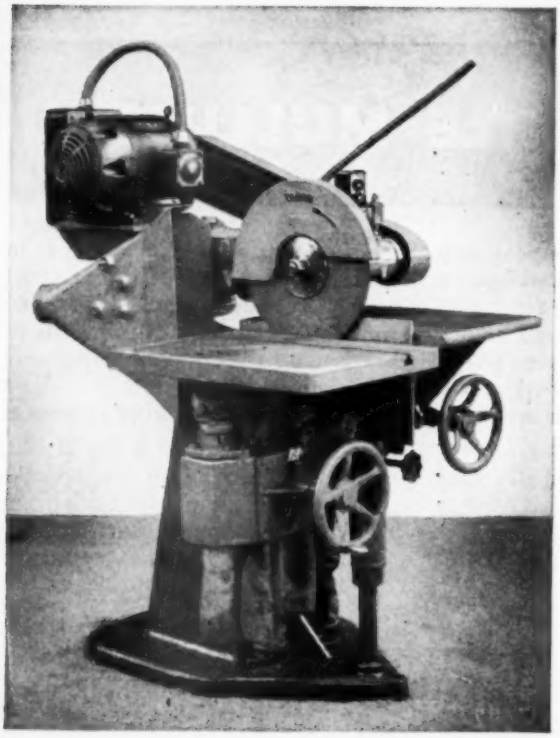
THE BEARDSLEY & PIPER COMPANY

2540 N. Keeler Avenue **Chicago 39, Illinois**

THE BEARDSLEY & PIPER COMPANY ARE MANUFACTURERS OF SAND-SLINGERS, SPEEDSLINGERS, SPEEDMULLORS, SCREENARATORS, MULBAROS, SHAKE-OUTS, SAND CONDITIONING MACHINES, GYRATORY SCREENS

Save PRICELESS TIME with the . . .

TABOR-BRASIVE CUT-OFF MACHINE



The above-all need of the day is high and ever higher production. Between pouring and shipping no time can be lost . . . and none need be.

A Tabor-Brasive Cut-Off Machine will more than keep pace with your increased production schedules. It will cut gates and risers from castings of manganese bronze, aluminum bronze, nickel, monel and other tough-cutting metals in a matter of seconds—unbelievably fast. Cuts are clean and close to the casting—snagging and finishing grinding are reduced to a minimum, often entirely eliminated.

Write for information, giving details of your cutting problems. There is a Tabor-Brasive Cut-Off Machine of a size and type to meet your requirements.

THE TABOR MANUFACTURING COMPANY
6225 Tacony Street • Philadelphia • Pennsylvania

Representatives: *Los Angeles, Calif.*, Snyder Foundry and Supply Co.; *Oakland, Calif.*, Pacific Graphite Co.; *Seattle, Wash.*, Carl F. Miller & Co.

The inspector is seated comfortably before the fluoroscopic window of the Picker Ray-Proof Combination X-Ray Inspection Unit. The Unit requires no manual unloading, since ejection of defective parts is automatic.

fluoroscopy or radiography?

The many benefits of x-ray inspection of parts *before* machining have been amply demonstrated in hundreds of case histories where lower costs and higher quality are the end results. The question then resolves itself in one of *method*. Within its limitations, x-ray fluoroscopy is the ideal answer in some cases; radiography is indicated in others. The determining factors are density and section thickness of the material to be examined.

This Picker Combination Conveyor Production Inspection Unit is designed to perform both fluoroscopy and radiography with equal facility. This single Combination Unit obviates the previous need for a separate apparatus for either function.

Industrial PICKER X-ray

A Picker engineer will be glad to survey your own inspection problems and recommend a practical procedure, based on your individual requirements. The Picker line of industrial x-ray inspection units embraces types designed not only for large quantity production inspection requirements, but also for small-scale examination where major investment is neither necessary or desirable.

PICKER X-RAY CORPORATION
300 FOURTH AVENUE • NEW YORK 10, N. Y.
WAITE MF'G DIVISION • CLEVELAND, OHIO

PICKER X-RAY CORPORATION, 300 FOURTH AVE., NEW YORK 10, N. Y.

We are interested in the inspection of:_____

Alloy_____ Quantity per hour_____

Maximum Section Thickness_____

Other Particulars_____

NAME_____

COMPANY_____

CITY_____ STATE_____

(This coupon can only cover the highlights of your inspection problem. If you wish to describe it more fully in a letter, it will help us in preparing a recommendation.)

What is Your AQ?

Here's a Challenge!*

Try your hand at this brief Grinding Wheel QUIZ and find out your A. Q. (Abrasive Quotient).

Grinding Wheel Quiz

* Question 1. Why is the modern grinding wheel partially responsible for today's high standard of living?

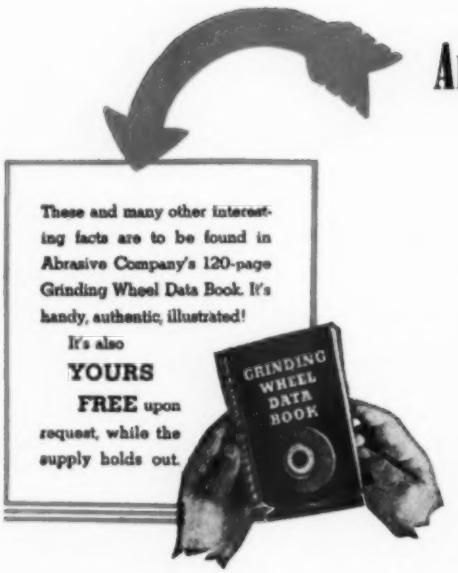
Question 2. May grinding wheels be identified by their color?

Question 3. How does a grinding wheel sharpen itself as it works?

Question 4. What is the weight of a vitrified aluminum oxide wheel measuring 8" in diameter by 2½" thick?

Question 5. What is Green Electrolon?

Question 6. How are standard abrasive grain sizes determined?


These and many other interesting facts are to be found in Abrasive Company's 120-page Grinding Wheel Data Book. It's handy, authentic, illustrated!
It's also
YOURS
FREE upon request, while the supply holds out.
GRINDING WHEEL DATA BOOK

Answers

1. Because, as a cutting tool, the grinding wheel has made possible much low-cost mass production of mechanical parts.
2. Yes. For example, Abrasive Company's Borolon Vitrified wheels in "K" Bond are blue. SB Borolon Vitrified wheels for regular tool and cutter grinding are red.
3. The grains on the wheel's surface are broken or pulled out under stress of work as they become dulled, thus continually presenting new, sharp cutting points.
4. Eleven pounds—as shown in the table on page 106 of the Abrasive Company Grinding Wheel Data Book.
5. Green Electrolon is a special type of silicon carbide suitable for grinding materials of exceptional hardness, such as tungsten and tantalum carbide.
6. By the number of openings per linear inch in the screens or sieves through which the abrasive grain is passed.

If you answered more than 3 you're not only very good, but you must have been reading Abrasive Company's Grinding Wheel Data Book!

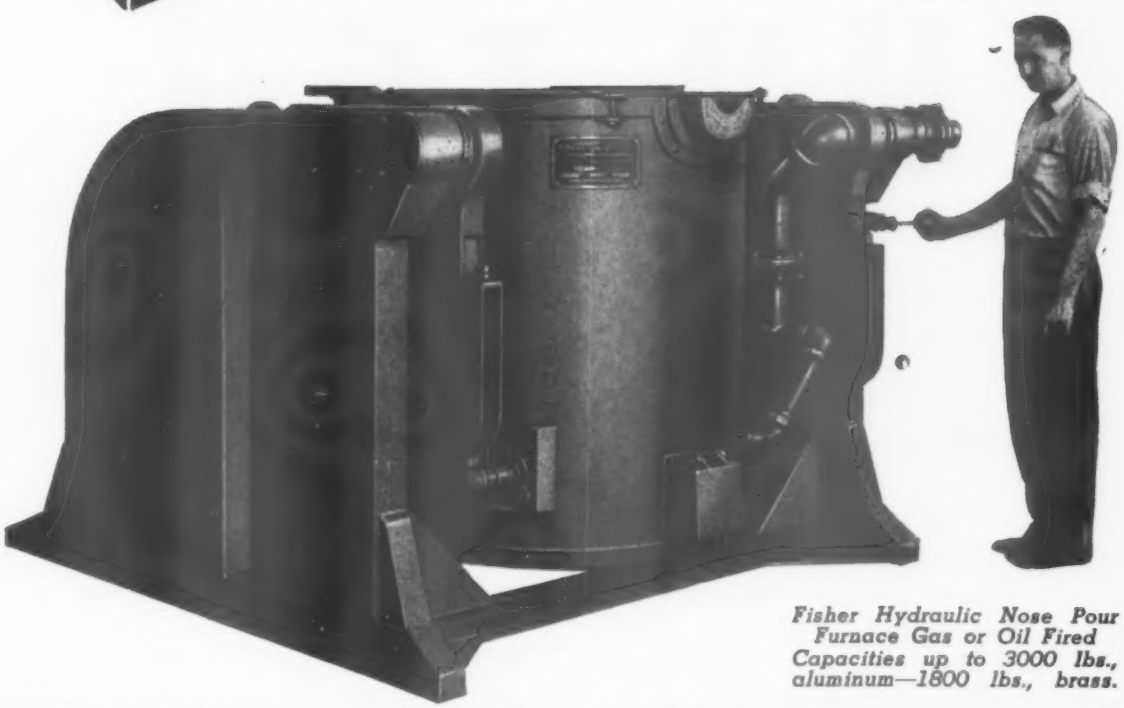
COMMANDING QUALITY . . . OUTSTANDING RESULTS

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS. PHILADELPHIA, PA. • CHICAGO BRANCH: 127 SOUTH GREEN ST.

DISTRIBUTORS IN ALL PRINCIPAL CITIES



Fisher Hydraulic Nose Pour Furnace Gas or Oil Fired Capacities up to 3000 lbs., aluminum—1800 lbs., brass.

Compactness, fuel economy, production efficiency and construction, with promise of above average service years, are certain to be leading requisites of metal melting equipment when the good old American custom of competition returns. These requisites can only be made realities through experience carefully blended with engineering ingenuity and facts. Fisher's scentific pioneering of melting equipment for every branch of the light metal field, for many years is evident in the "HNP" Furnace illustrated. The "HNP" is designed to fully satisfy the practices that have been so decidedly changed in the past few years, embodying the advantages of compactness, fuel economy, production efficiency and rugged construction. This type furnace is widely used for melt-down, for hot charging other furnaces, for permanent mold and die casting work, as well as regular melting. Consult Fisher for a scientific answer to any and all metal melting requirements.

Request Bulletin No. 550 showing complete Fisher Line in brief.

5519 N. WOLCOTT AVENUE, CHICAGO 40, ILLINOIS

Fisher FURNACE COMPANY

Engineers and Manufacturers

FOR BETTER CORES

HOUGHTON'S

HY-TEN

CORE BINDERS

OIL TYPE

New DRY TYPE

. . . Oils that enable increased oven production. Cores made with Hy-Ten will permit faster baking without harming surfaces, thin sections or sharp edges.

. . . Oils that evolve less gas.

. . . Oils that are polymerized—not air-drying. Mixes do not encrust.

. . . Oils that are uniform—made under strict laboratory control.

New low-bake oils, too, that save fuel and permit using volatile inhibitors in core mix.

Dry core binders represent a new concept in the science of core making.

Types are offered for non-ferrous and for grey iron or steel casting. Each has its merits, including reduced baking time, high hot strength, minimum gassing and easy clean-out.

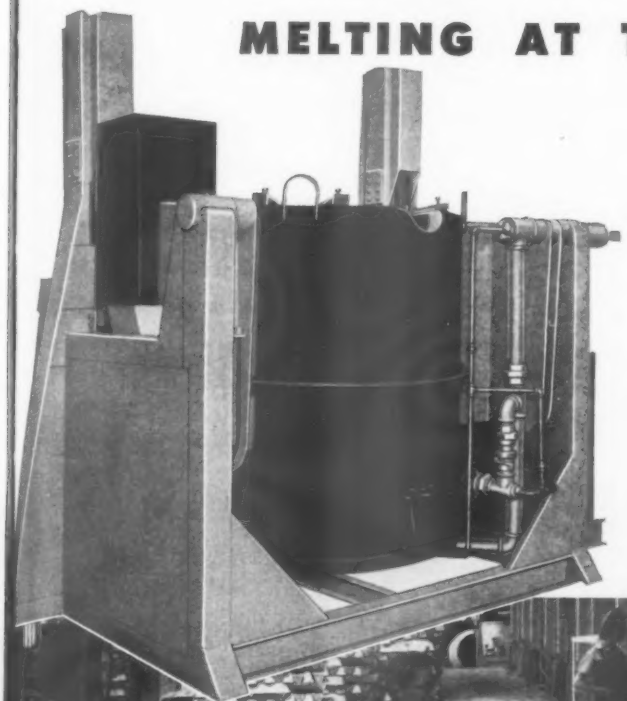
For complete data on Hy-Ten Dry Core Binders, call in the Houghton Man, or write E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia 33, Penna.

HOUGHTON FOUNDRY RESEARCH HELPS

Make Better Castings

STROMAN HYDRAULIC TILT MELTING FURNACES

. . . HANDLE THE AULMINUM MELTING AT THIS MODERN WAR PLANT



In this streamlined foundry nine 1000 pound Stroman Hydraulic Tilt Furnaces are melting the aluminum that casts many essential items for use on the far flung battle fronts of the world. At this plant as well as hundreds of others, Stroman Furnaces were chosen for their greater stamina, melting perfection, ease of operation, speed of production and fuel economy.

Their ease of handling due to the many exclusive safety devices, simplicity of construction and fool-proof heating system, makes it possible for women to control their operation perfectly.

Stroman built furnaces are dependable and economical . . . they are the furnaces you should use for faster, better melting on all types of non-ferrous metals.

A letter will bring full information on any type furnace you may desire . . . why not write to-day?

Stroman makes Hydraulic Tilt, Mechanical Tilt, Hand Tilt and Stationary Furnaces of all sizes for the melting of Brass, Bronze, Aluminum, Magnesium and all other types of non-ferrous metals . . . Also Stroman Blowers.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO 6

FOR *Quicker* SHAPING, GRINDING, POLISHING

USE SKILSAW PORTABLE GRINDERS!

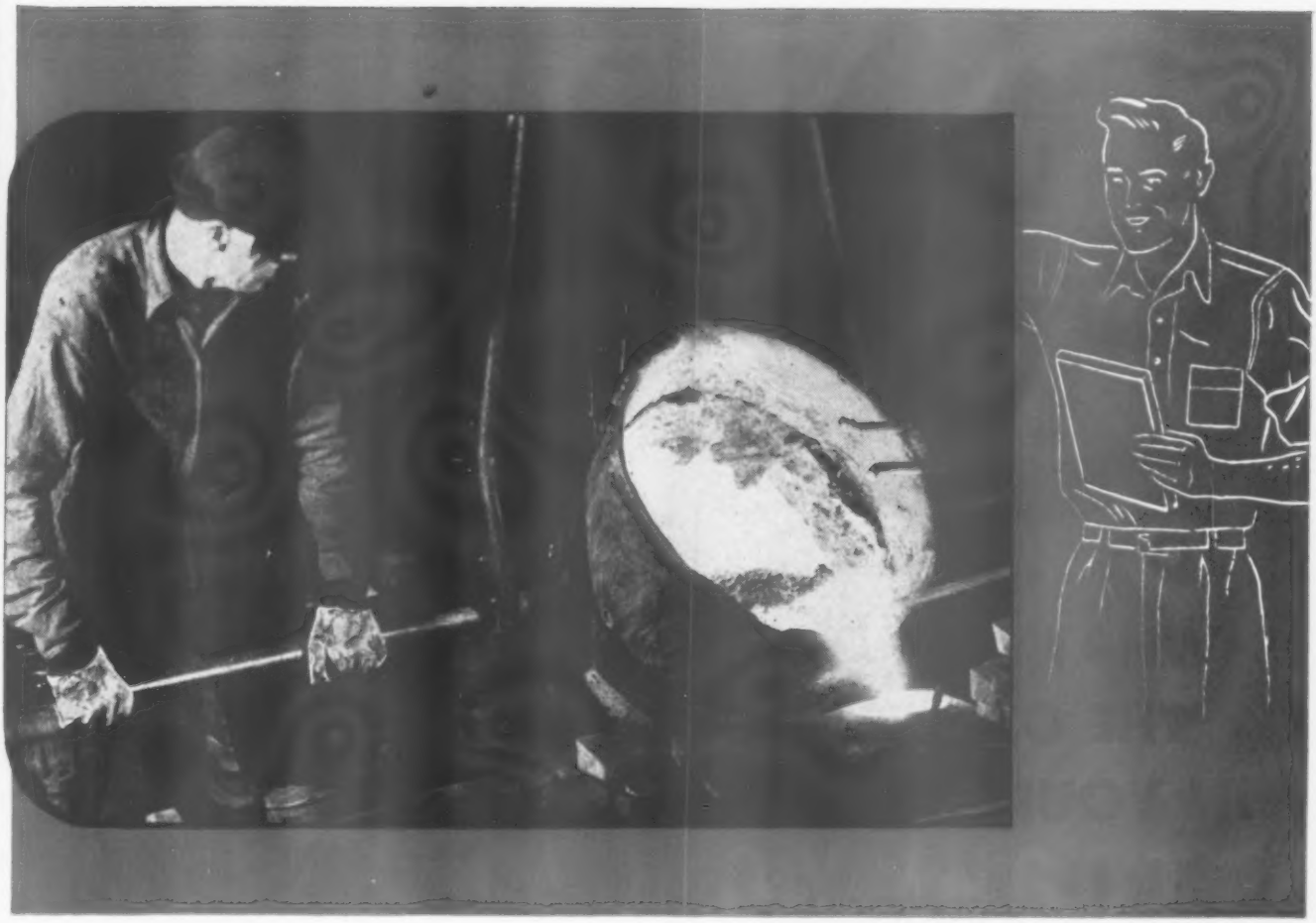
• SKILSAW PORTABLE GRINDERS deliver *top load speed*, even when the going is toughest. That's why they grind down beads, studs and fins faster . . . speed up shaping, buffing and polishing. They're quality-built throughout, with many superior features such as special ball-bearing inserts to absorb vibration and spindle thrust. That's why SKILSAW PORTABLE GRINDERS run smoother, cooler, and last longer.

You'll save time, money and manpower with SKILSAW PORTABLE GRINDERS on every finishing job. Ask your distributor to demonstrate SKILSAW PORTABLE GRINDERS on your own work.

SKILSAW, INC.
5033-43 Elston Avenue, Chicago 30, Illinois
Sales and Service Branches in All Principal Cities

ARMY NAVY

SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE



IF THERE ARE HIDDEN DOLLARS IN YOUR FOUNDRY

The man who's "Always at Your Elbow" will find them

The Republic Pig Iron Metallurgist is an expert at finding hidden foundry profits. These dollars are often brought to light by some slight change in production that enables you to increase your output of finished castings with your present equipment.

It may be that you are using your equipment to its full advantage, but you can't be certain until a Republic Pig Iron Metallurgist has made a complete survey of your foundry, your equipment and your methods.

Just who is this fellow who spends his full time helping foundrymen? True, he's a Metallurgist who knows the technical side of irons and what they should and should not do under various conditions—but more than that, he's an experienced and practical foundryman who knows foundry practice from actually working in foundries.

The slogan phrase "Always at Your Elbow" means just what it says. A skilled Republic Pig Iron Metallurgist is ready to step into your foundry whenever you need him. Write, wire or phone us—and he will call on you PROMPTLY.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO

Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Bldg., New York 17, N. Y.

Republic PIG IRON

"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

ALSO TRUSCON FOUNDRY FLASKS—REPUBLIC CORE WIRE—FOUNDRY NAILS

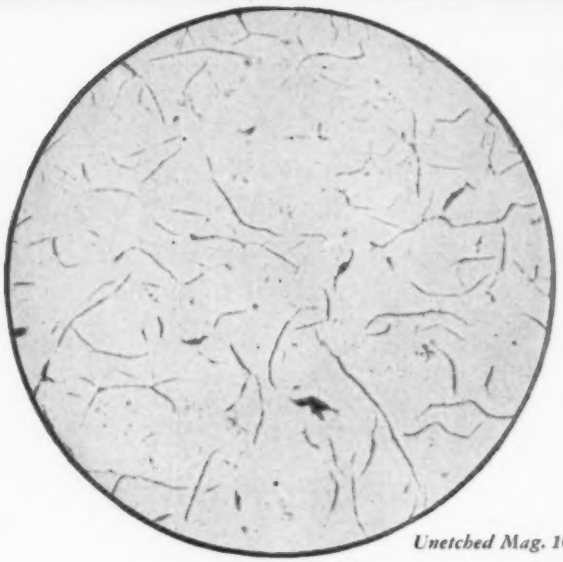
WHAT ABOUT THE OXIDES IN YOUR IRON?

Don't overlook the value of deoxidizing in the cupola. Experience shows that the difference between *good* or *inferior* castings is often due to the degree of deoxidation attained. An easy, economical way to obtain satisfactory deoxidation is by the addition of "Ferrocarbo" briquettes to the cupola charge. Accompanied by a liberation of heat, the chemically combined deoxidizing elements in "Ferrocarbo" readily dissociate in the melting zone and react with all oxides to give you a thoroughly deoxidized and superheated iron.

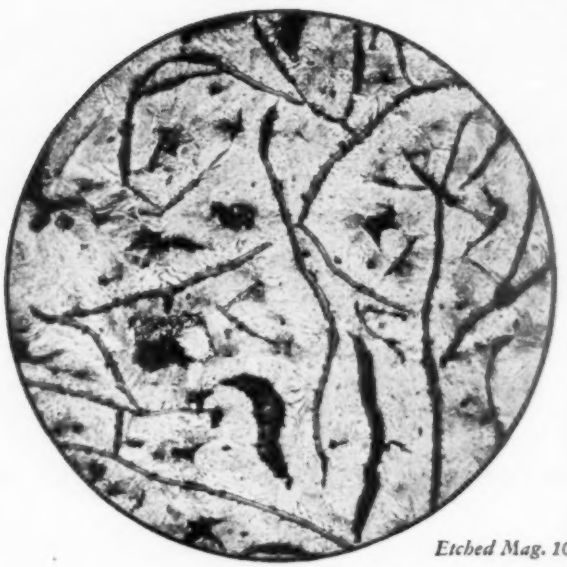
Good castings are consistently produced from "Ferrocarbo"-processed iron. Put "Ferrocarbo" to work in your foundry and get—

1. **Super-heated iron of greater fluidity**
2. **Denser, finer grained, higher strength castings**
3. **Freedom from hard spots—improved machinability**
4. **Fewer rejects**

"Carborundum" and "Ferrocarbo" are registered trade marks of, and indicate manufacture by, The Carborundum Company.



Unetched Mag. 100x



Etched Mag. 100x

Effective deoxidation is important not only from the standpoint of eliminating defects, but also in obtaining the type of grain structure, density of matrix and random type of graphite pattern desired.

The above photomicrographs show the structure of cast iron deoxidized with "Ferrocarbo."

WRITE for more information on this effective deoxidizing agent.

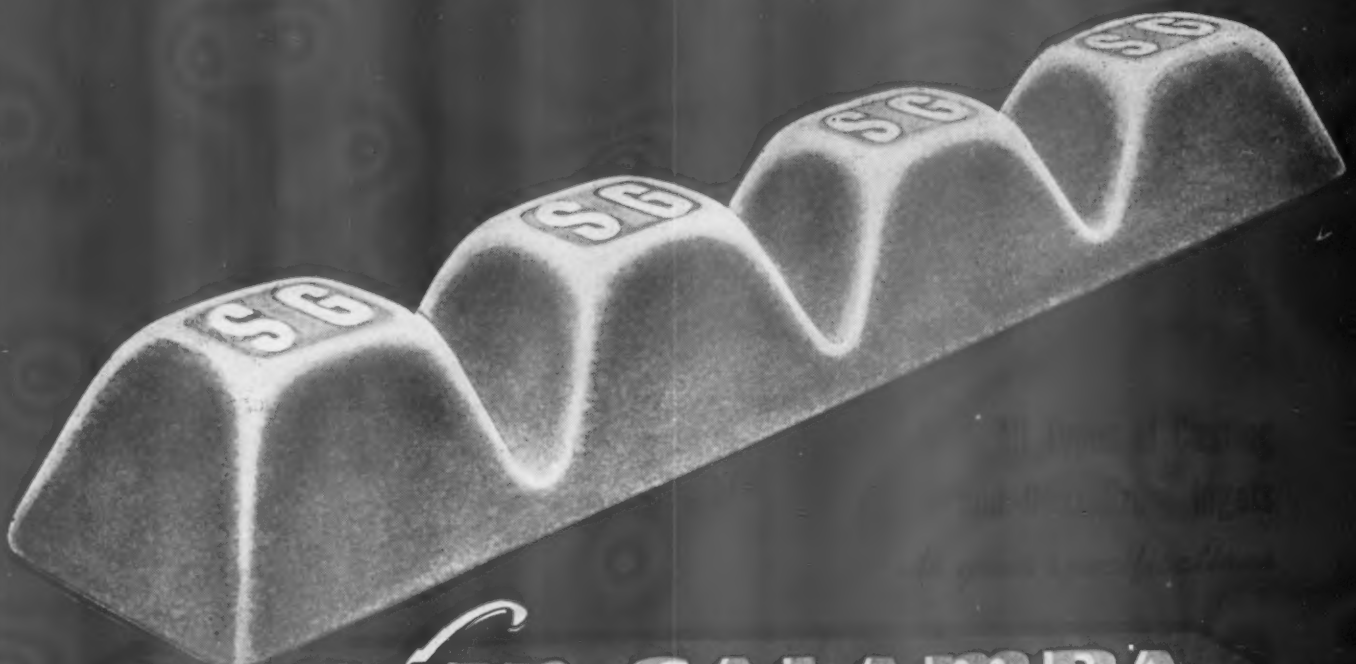
THE CARBORUNDUM COMPANY

Refractories Division, Perth Amboy, N. J.

"Ferrocarbo" distributors:
KERCHNER, MARSHALL & COMPANY, Pittsburgh and Cleveland
MILLER & COMPANY, Chicago, St. Louis and Cincinnati

Ferrocarbo by **CARBORUNDUM** TRADE MARK

Specify S-G Aluminum ALLOY INGOT



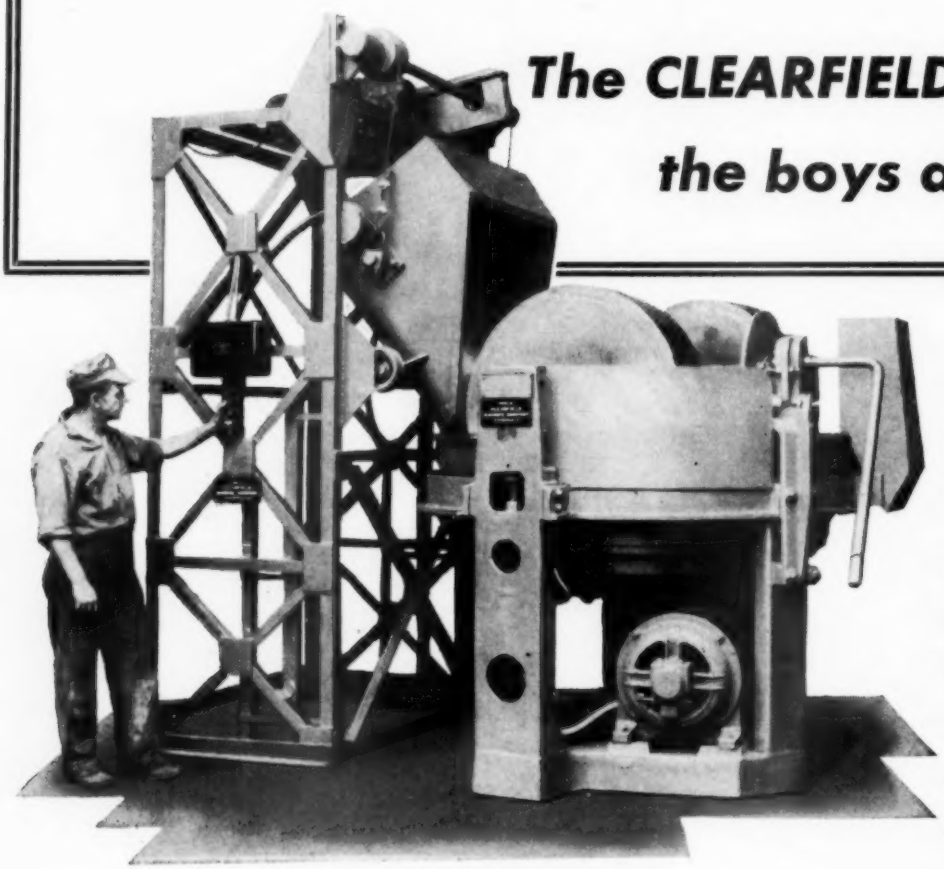
SONKEN-GALAMBA Corporation

MEMBER ALUMINUM RESEARCH INSTITUTE

Riverview at 2nd Street · Kansas City, 18, Kansas

AIN'T SHE NEAT, SWEET, HANDSOME AND FAIR?

The CLEARFIELD'S a daisy the boys all declare!



TIMKEN BEARING EQUIPPED

The model pictured is the 610 with bucket loader. These units are regularly turning out 15 to 20 tons an hour of well prepared gray iron molding sand and proportionate amounts of other types. Compact too: headroom required about ten feet and floor space seven by eleven.

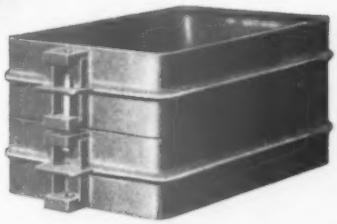
Other capacities to meet your requirements. All are fully described in our catalog No. 77. Write for your copy.

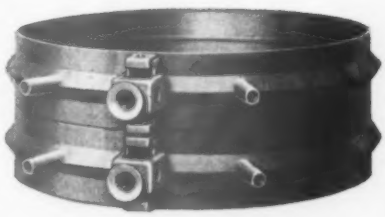
INVESTIGATE THE CLEARFIELD BEFORE YOU BUY ANY SAND CONDITIONING EQUIPMENT

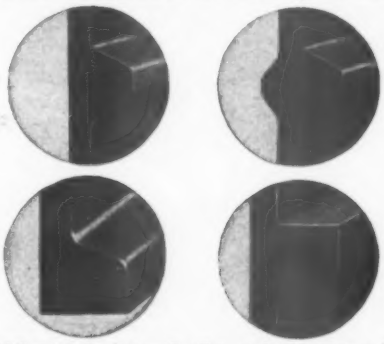
CLEARFIELD MACHINE COMPANY

CLEARFIELD PENNSYLVANIA, U. S. A

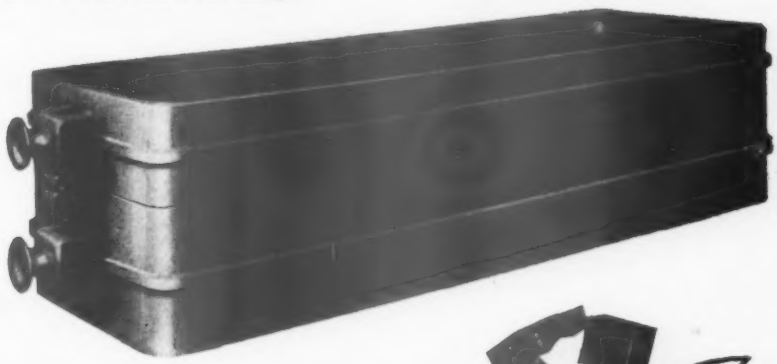
In peacetime or war, Sterling sincerely endeavors to take care of ALL customer friends, regardless of the size of order. Your current requirements may call for as many as 1,000 flasks . . . or only 2 pins . . . in either case, the order will have our careful attention and will be shipped as rapidly as conditions permit. Remember, Sterling is backed by 40 years of specialized experience and has the facilities to turn out practically any type and size of flask or pin...and in any quantity. For complete foundry flask service — consult Sterling.







All-welded, integral ribs and flanges; solid center reinforcing rib; square flanges; full width bearing, aids speed and accuracy . . . simplifies ramming and shaking out. (Pat. 1974292)



A 4306-1P

Quality...

THAT'S WHAT WE MAKE

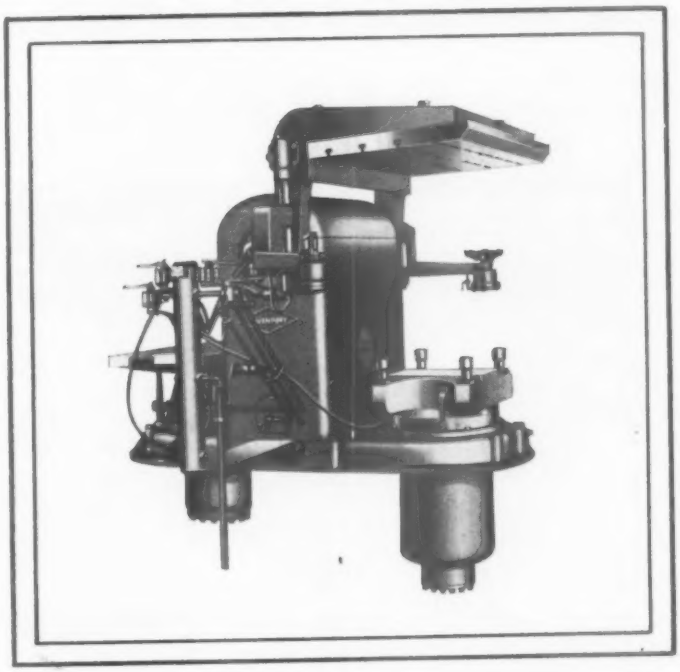
A long time ago — when we started smelting — we had to make a decision. The question was . . . should we strive for volume production or a more limited quality production? Well, we made our decision . . . and have made quality alloys ever since. We've done very well, too, in building up our volume . . . and it is increasing every day.

Silverstein and Pinsof

INCORPORATED

1720 ELSTON AVENUE CHICAGO 22, ILLINOIS

BRASS • BRONZE • ALUMINUM • LEAD • TIN • SOLDER • TYPE METALS • BABBITT • ZINC BASE ALLOYS



DAVENPORT ROLLOVER
MODEL A NO. 34

Simplicity

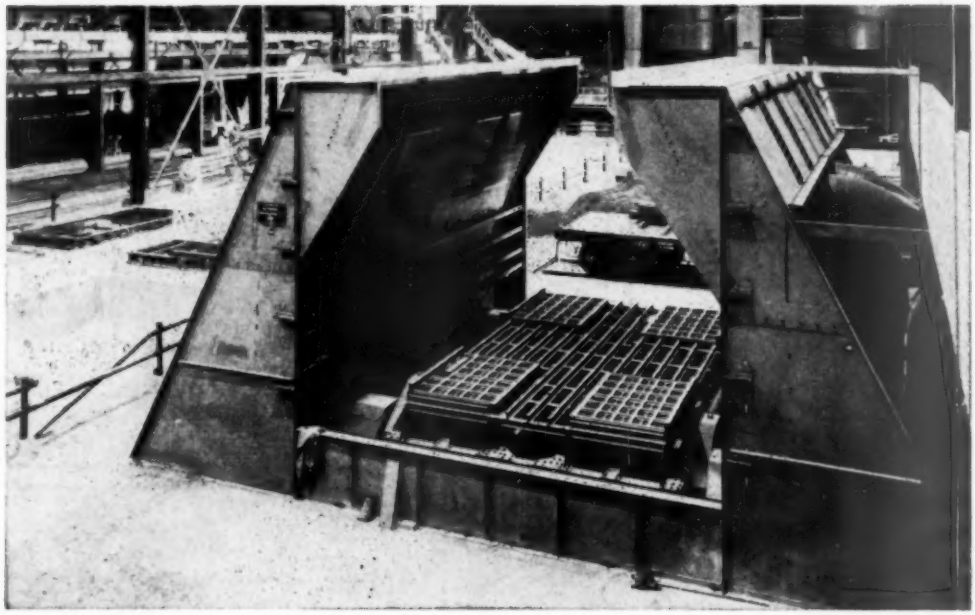
QUAD SHAKE-OUTS

DO GIANT'S WORK!

★

The Simplicity Quad Shake-Out, shown by cut, is operating in a Western Foundry where only Proven Equipment was installed

★



SIMPLICITY QUAD SHAKE-OUTS are operating today in many foundries producing large castings for war work. One such job is the unit cast tank hull, which with flask and sand weighs around 170,000 pounds. The flask is shaken out and the core sand knocked out of the hull casting in the total elapsed time of only ten minutes.

Quad Shake-Outs have been built in sizes ranging from 10′ x 10′ to 15′ x 22′ in vibrating area. Special deck areas can be supplied for special jobs. The positive blows struck against the flask or casting by the massively constructed vibrating units assure fast and certain movement of the sand, no matter how hard it is baked.

Our engineering representatives will check your job and recommend the proper equipment.

"PURCHASE SHAKE-OUT CERTAINTY AND ASSURED SERVICE"

Simplicity Engineering Company

DURAND, MICHIGAN

FOR CANADA: Waterous Limited, Brantford, Ontario

YOUNG BROTHERS' ENGINEERS

Authorities on

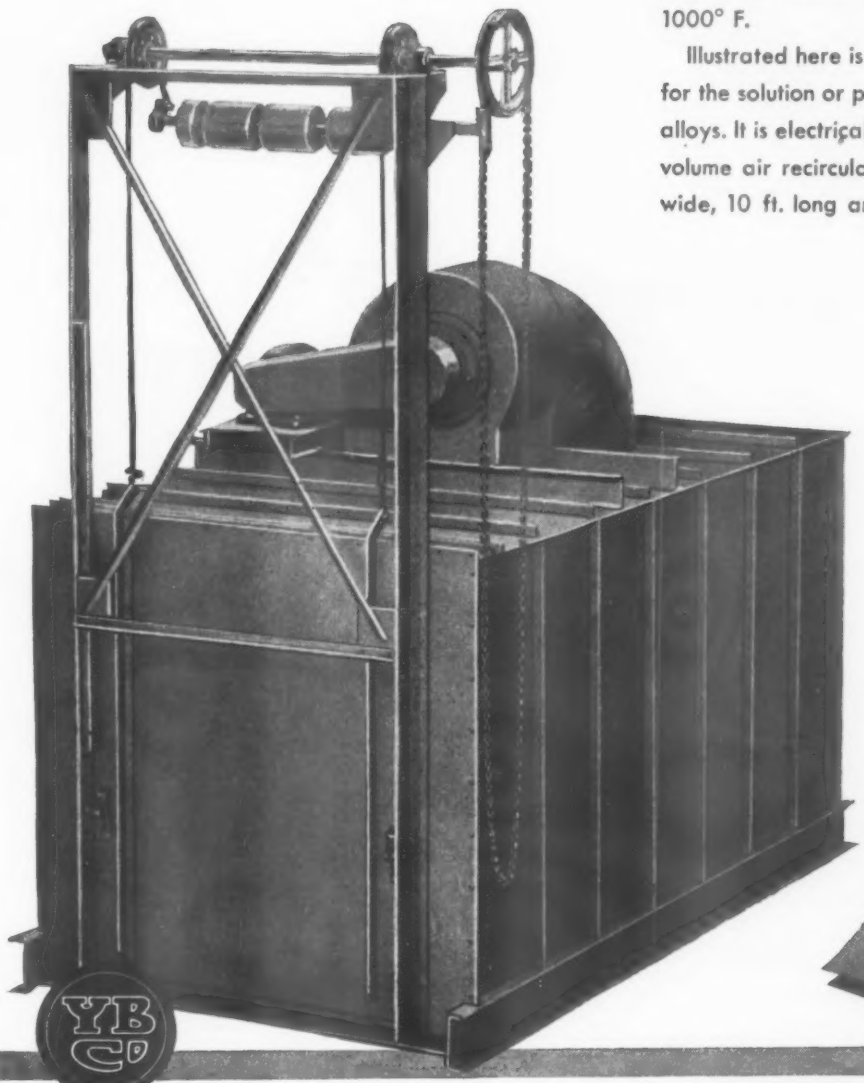
HEAT TREATING OVENS

Young Brothers have designed and built hundreds of ovens for low temperature heat treatment of both ferrous and nonferrous metals for temperatures up to 1000° F.

Illustrated here is a typical example. This is an oven for the solution or precipitation treatment of aluminum alloys. It is electrically heated and equipped for large volume air recirculation. It accommodates a car 4 ft. wide, 10 ft. long and 5 ft. high. And gas or oil may be used as a heating medium.

This type of oven is also suitable for other types of heat treating. When controlled atmospheres are required as they are for some types of magnesium alloys, the oven is built with a gas-tight lining and special gasketed door

ASK FOR BULLETIN 4-T



ESTABLISHED IN 1896

YOUNG BROTHERS COMPANY

6508 MACK AVENUE • DETROIT 7, MICHIGAN

he knows how to use air—do you?

By effectively using natural air the paratrooper skillfully controls his speed and direction of descent. Compressed air, effectively used and properly controlled, does many tedious jobs for industry, saving time, labor and life or limb.

Air power is efficiently and safely handled with Schrader Air Control Products, a comprehensive line of modern air devices. Some of these products simply enable you to use air efficiently and conveniently, others boost production by eliminating slow operations. Still others reduce operator fatigue, or increase the safety of skilled fingers.

Whatever types of machines you are now operating, whatever you now make or plan to make after the war, you may be rewarded out of all proportion to cost by adding the power and versatility of air to new or war-worn machines.

For a specific example of the application of Schrader Air Control Products, look into the advantages of Schrader Hand-Operated Safety Control Sets, Foot-Operated Machine Control Sets, and Kick Press Control Sets. See your distributor or write to Schrader, Dept. Q.

PROTECT SKILLED HANDS with Schrader Hand-Operated Safety Control Sets. The compressed air operates the machine while operator's hands are kept at safe distance from the danger zone. Increase production by reducing fear and fatigue. Adaptable to most presses and machines at a very moderate cost.

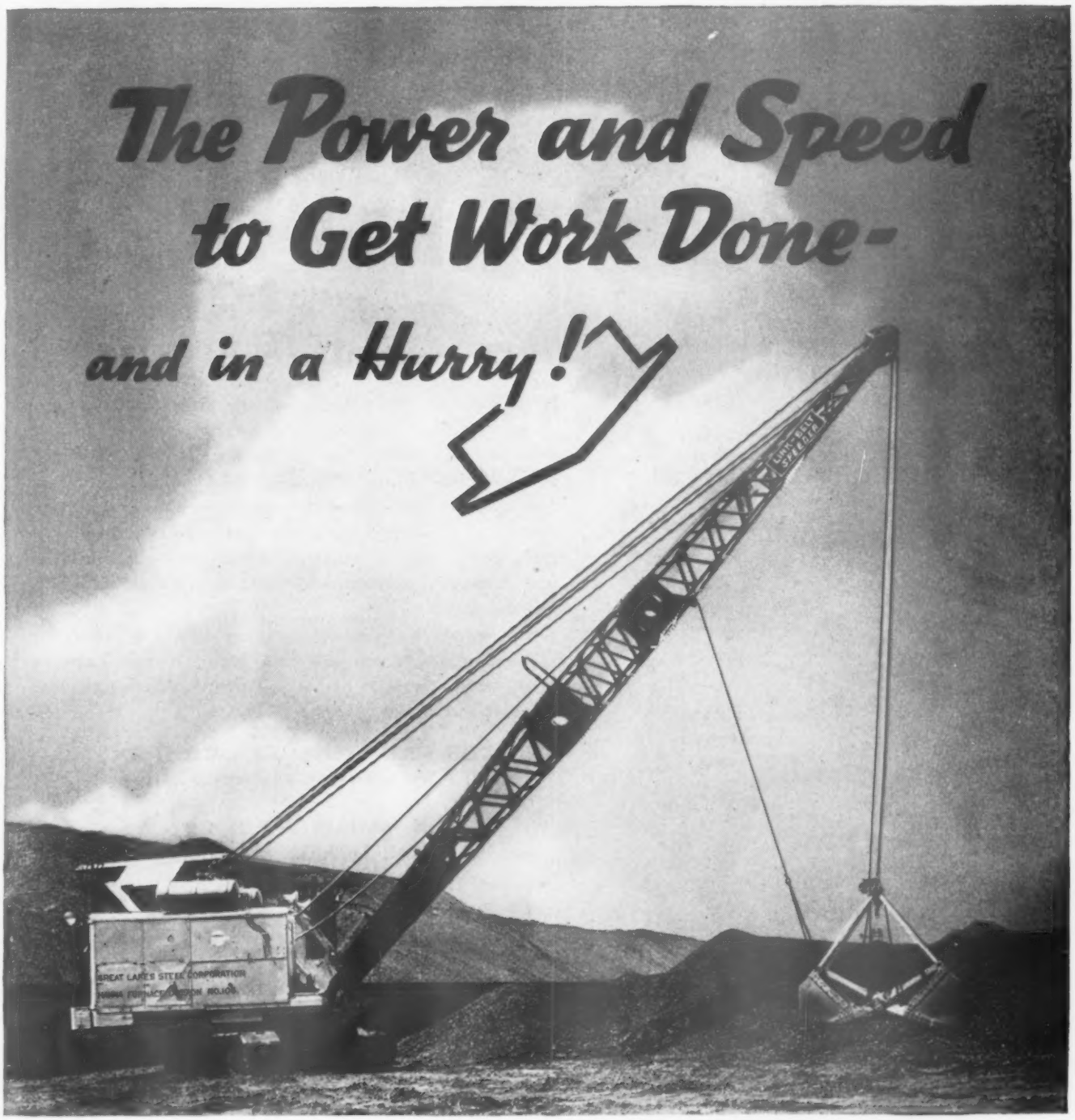
100th ANNIVERSARY 1844 1944

Air Valves 2, 3, 4-way • Air Operated Machine Controls
Air Operated Safety Controls • Quick Acting Couplers
Blow Guns • Air Ejection Sets • Hydraulic Gauges

Schrader
CONTROLS THE AIR

MADE BY THE MAKERS OF SCHRADER TIRE VALVES AND TIRE GAUGES

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated,* BROOKLYN 17, NEW YORK



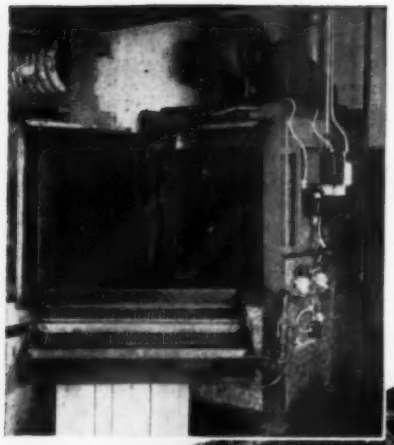
Here's the ideal machine for fast work around the foundry yard. Its speed and maneuverability belie its rugged, massive, well-balanced strength. Ease-of-handling conserves man hours and gets things done right—and in a hurry!

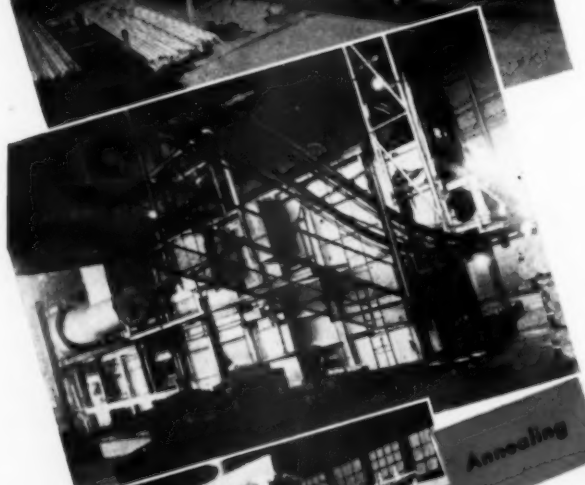
9745

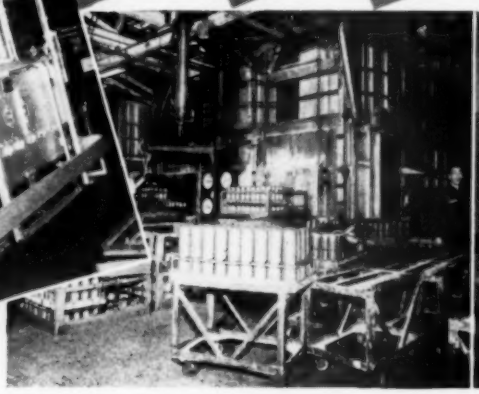
LINK-BELT SPEEDER

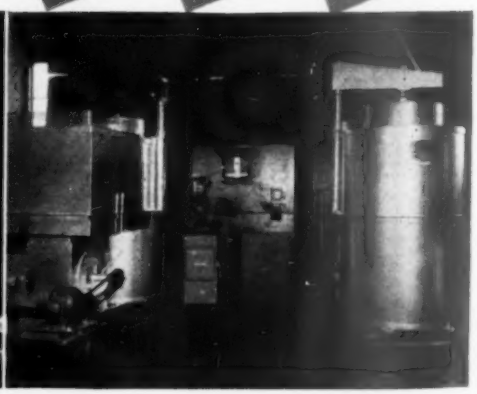
Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)









. . . here's the name to remember —when you have a heat treating problem

MAEHLER

THE name *Maehler* means maximum efficiency in heat treating. Treatment of today's metals calls for the kind of heat uniformity that Maehler furnaces provide. Maehler originated and perfected the re-circulating air heat system whereby air from a heater is circulated through the furnace and back to the heater. This system provides heat uniformity that is virtually perfect. On all types of heat treating you can lower operating costs, increase output and do a better job with a Maehler furnace.

Experienced Maehler engineers are ready to work with you in designing a complete heat treating system — heaters, ovens, racks, cars — to assure you of a high capacity, high efficiency installation. Write today.

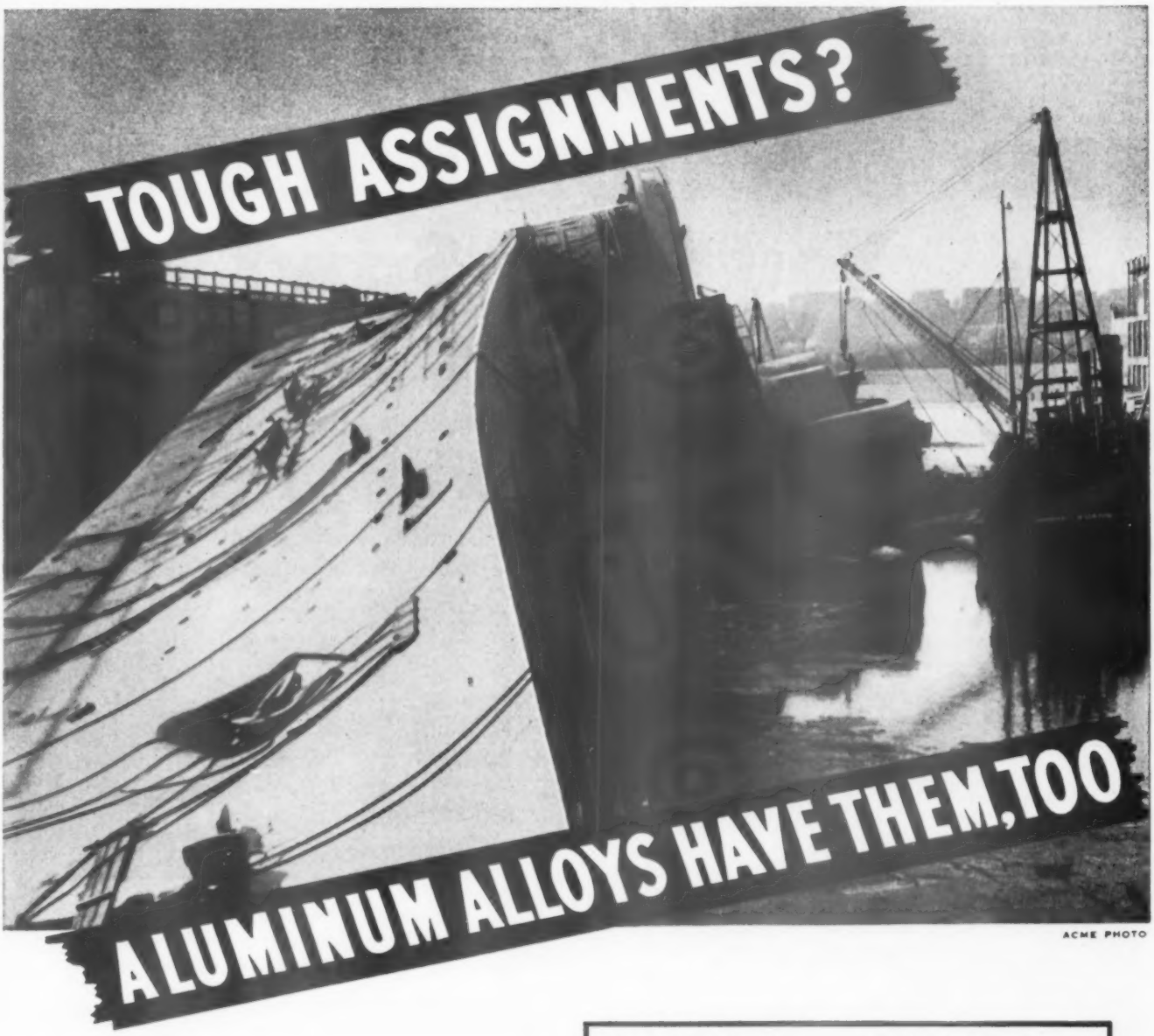
THE PAUL MAEHLER COMPANY
2200 W. Lake St., Chicago 22, Illinois

THE MAEHLER LINE IS SUPERIOR
for all kinds of Heat Treatment

- Complete range of furnaces for every kind of metal and every type of treatment.
- Gas fired, oil fired or electrically heated units for handling temperatures up to 1300° F.
- Exceptional heat uniformity — within 5°.

- Approximately 93.6% of Maehler's production is devoted to repeat orders . . . proof of the superiority of Maehler ovens and furnaces.

Annealing · Aging · Drawing · Tempering · Normalizing · Stress-Relieving



The righting of the Normandie was a tough assignment, but it proved an opportune school for training hundreds of Navy divers.

Aluminum Alloys furnished by us are also meeting tough assignments daily, such as the punishing service in aircraft, tank and marine engines. At the same time, other much smaller and more delicate parts made from our Alloys are functioning with extreme precision in an equally important, but less spectacular, manner.

In the production of the Alloys to meet these tough assignments, *our* forces, too, have found a valuable training ground . . . training which will be invaluable to you in your problems of post war production.

The National Smelting Company
Cleveland 5, Ohio

Niagara Falls Smelting & Refining Corp.
Buffalo 17, New York

Sonken-Galamba Corporation
Kansas City 18, Kansas

U. S. Reduction Co.
East Chicago, Indiana

Aluminum and Magnesium, Inc.
Sandusky, Ohio

The American Metal Company, Limited
New York City 6

Apex Smelting Co.
Chicago 12, Illinois

Berg Metals Corporation
Los Angeles 11, California

The Cleveland Electro Metals Co.
Cleveland 13, Ohio

Federated Metals Division American Smelting and Refining Company
New York City 5 and Branches

General Smelting Company
Philadelphia 34, Pennsylvania

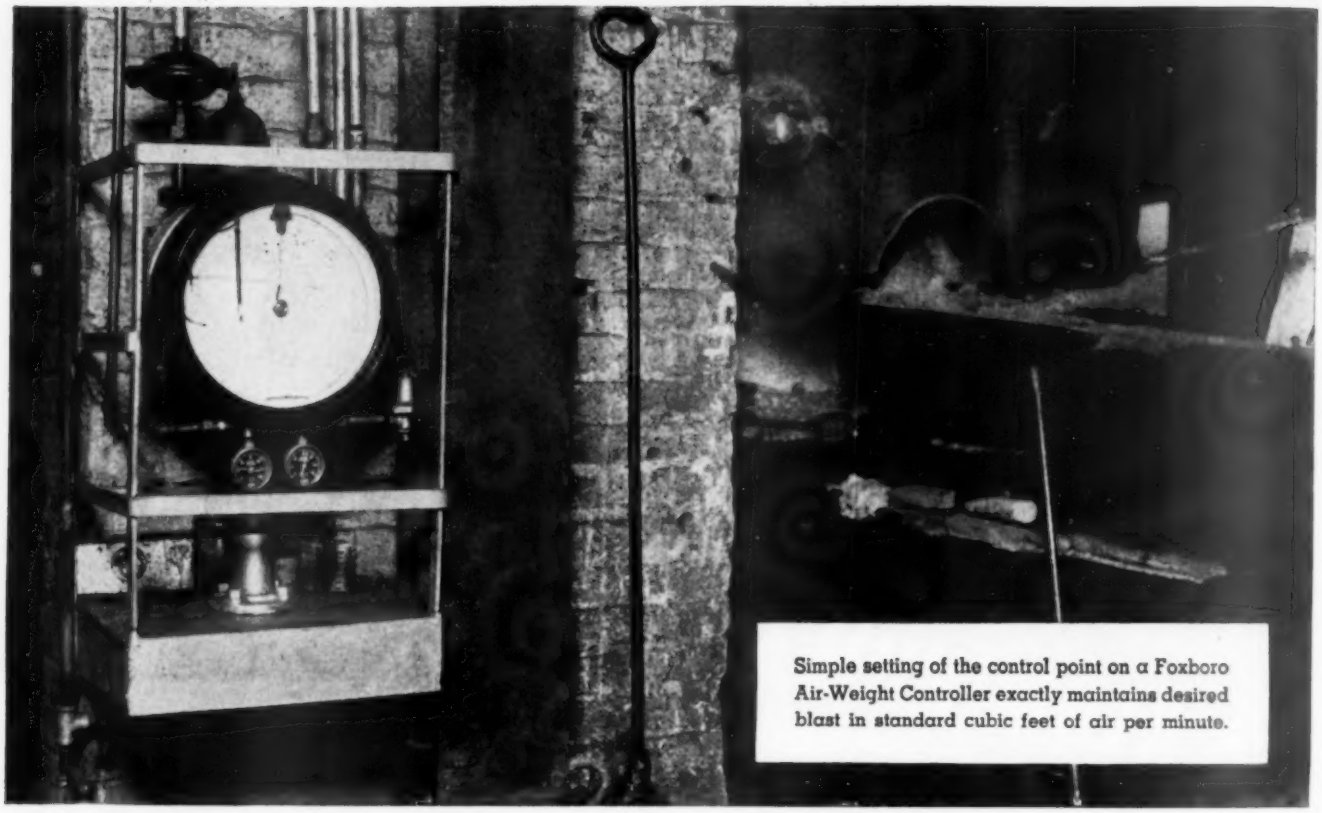
Samuel Greenfield Co., Inc.
Buffalo 12, New York

William F. Jobbins, Inc.
Aurora, Illinois

R. Lavin & Sons, Inc.
Chicago 23, Illinois

ALUMINUM RESEARCH INSTITUTE
111 West Washington Street, Chicago 2, Illinois

Slickest
PRODUCTION BOOSTER
You Ever Saw!



Simple setting of the control point on a Foxboro Air-Weight Controller exactly maintains desired blast in standard cubic feet of air per minute.

Easily-installed Foxboro Controller keeps heat hotter . . . ends pigging, cuts rejects

Instead of pigging the first run of every heat, why not convert it into good, sound castings, and boost your output tonnage? All it takes is the simple installation of a Foxboro Air-Weight Controller to give you an added ½ to 1 ton of profitable production from each cupola *every day!*

Foxboro Air-Weight Controllers automatically control the blast *by weight of air*, instead of volume. They maintain uniformly hotter heats from start to finish, regardless of wind-box pressure, atmospheric temperature or barometric pressure. You'll get consistently better melting, hotter heats without burning, uniform pouring conditions that prevent faulty castings and eliminate pigging!

Learn full details of this easy way to step-up cupola efficiency *practically overnight!* Write for Bulletin B-268 on Foxboro Air-Weight Controllers. Names of nearby users on request. **The Foxboro Company, 32 Neponset Avenue, Foxboro, Massachusetts, U. S. A.**

RECORDING · CONTROLLING · INDICATING

FOXBORO Instruments

$88,000 Saved IN LESS THAN A YEAR BY PALLETIZATION

Automatic
TRADE MARK
TRANSPORTER
ELECTRIC PROPELLED

Replaces two-wheel hand trucks in a warehouse to handle cartridge tanks . . . CONSERVES MANPOWER, MATERIALS and COSTS . . . . .

Saving No. 1—crating of tanks, previously required, was completely eliminated, releasing men for other work.

Saving No. 2—now instead of the full time of ten men and one third the time of six carpenters, four men perform the entire shipping operation. One man operating an "AUTOMATIC" TRANSPORTER now loads and blocks a freight car in 1½ hours as compared with the old time of four hours when four or five men were used.

Saving No. 3—huge reduction in need for critical fireboard and lumber. 2520 board feet of lumber are saved daily through use of pallets.

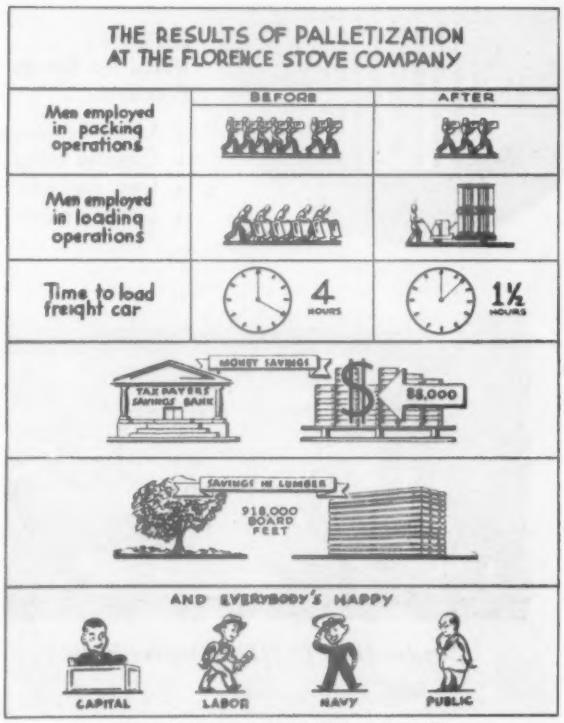
NO STRAINING—TUGGING—PULLING Nor PUSHING with the "AUTOMATIC" TRANSPORTER

POSITIVE MECHANICAL BRAKE • CONTROLS IN STEERING HANDLE • FORWARD AND REVERSE SPEEDS • FRONT WHEEL POWER DRIVE • SHOCKLESS HYDRAULIC PLATFORM LIFT WITH EASY FOOT CONTROL • "DEAD-MAN" CONTROL

PHOTO AT LEFT: Four men handle the complete shipping operation of these 6" tanks. Three men palletize and strap while the fourth moves the unit loads to the freight car and also blocks the car. Formerly the full time of 10 men and one third time of 6 carpenters was needed for shipping operations.

CENTER PHOTO: A pallet load is taken up the specially built ramp from the warehouse floor to the loading dock.

PHOTO AT RIGHT: Placing one of the 18 pallets loaded in every freight car. It now takes this man 1½ hours to load and block a car. Formerly it took four or five men four hours.



PHOTOS AND CHART COURTESY U. S. NAVY

WRITE! A complete case history covering this "AUTOMATIC" TRANSPORTER application will be sent on letterhead request.

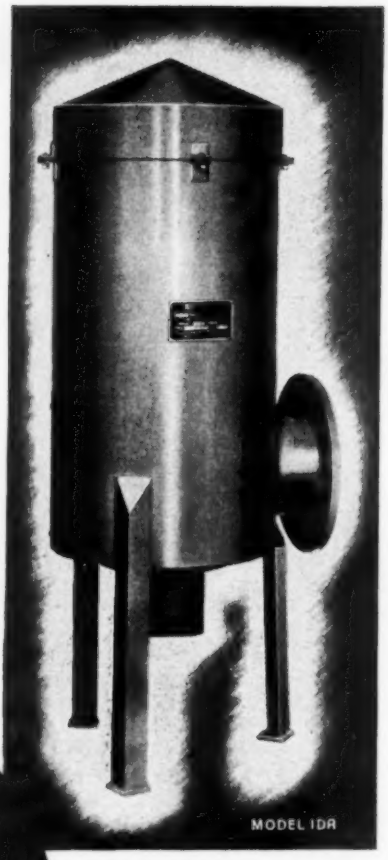
MANUFACTURERS FOR OVER THIRTY FIVE YEARS *Electric Propelled* **INDUSTRIAL TRUCKS**

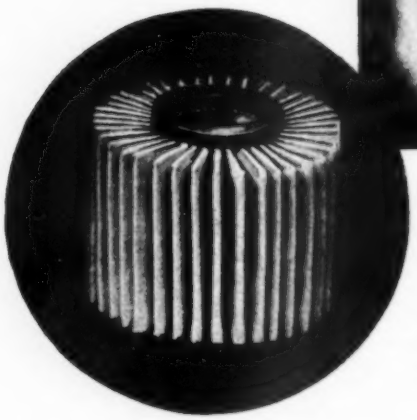
AUTOMATIC TRANSPORTATION CO.

DIV. OF THE YALE & TOWNE MFG. CO.

121 WEST 87th STREET — CHICAGO 20, ILLINOIS

new STAYNEW Intake Air Filter





Exclusive Radial Fin Construction Provides:

- ★ More Filtering Area
- ★ Greater Efficiency
- ★ Less Resistance
- ★ Less Frequent Servicing

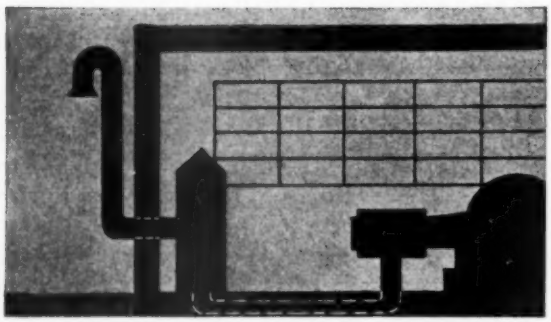
ALL THE CONVENIENCE OF GROUND LEVEL INSTALLATION

ALL THE EFFICIENCY OF HIGH LEVEL AIR INTAKE

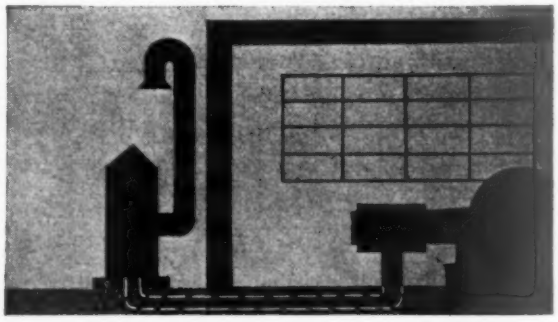
NOW you can equip compressors and internal combustion engines with a Staynew filter providing all the recognized advantages of the famous Protectomotor line . . . *plus* an exclusive combination of two new features.

The new filter, Staynew Model IDR, or IDRS (Silencer), is so constructed that *installation and servicing can be effected at ground level* (right in the engine room itself if preferred), and the *actual air intake located at the most suitable point.*

Models available with solid base for installation when compressor or engine intake is below floor level.



Model IDR INSIDE Engine Room



Model IDR OUTSIDE Engine Room

Engineering Data on request

STAYNEW PROTECTOMOTOR FILTERS

Representatives in Principal Cities

DOLLINGER CORPORATION

(Formerly Staynew Filter Corporation)

36 Centre Pk.
Rochester 4, N. Y.

ROURA DUMP HOPPERS

DO THE JOB EASIER, QUICKER, CHEAPER

- If you are looking for a way to shave dollars off your handling and shop distribution costs—right here is your answer.
- The Roura, automatic action, dump hopper is not an untried, fancy gadget—hundreds of them have had tough everyday use in many of the country's best managed plants over the last fifteen years.
- Roura hoppers will simplify and speed up your parts handling, saving both time and money.
- They're designed to fit any standard type lift truck and can be built to handle any kind of material, hot or cold, wet or dry.
- Automatic dumping feature saves tons of heavy lifting and carrying.
- Roura hoppers are sturdy, compact and absolutely safe—built for a long life of everyday service, nothing to get out of order.
- If you are interested in cutting your parts or materials handling costs just send us a letter or a card—We will be glad to send recommendations and prices to fit your needs.

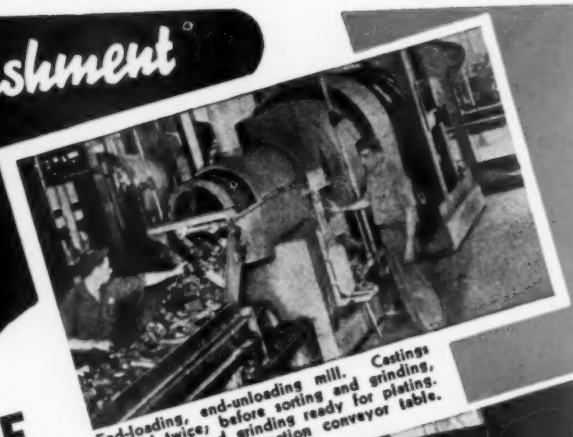
SPECIFICATIONS

- Dimensions: 66" long, 34" wide, 46" high. Capacity: one yard. Hopper built of 3/16" steel plate reinforced with 2 x 2 x 3/16" angle. Electric welded throughout. Stand is built of 1/2" material, sturdily welded and has 12" x 28" opening for lift trucks. Total Weight 700 pounds.

Get the full benefit from your tier lift trucks with Roura self-dumping hoppers

ROURA IRON WORKS 1405 WOODLAND AVENUE DETROIT, MICHIGAN

Another Year of Accomplishment with many a Compliment for Ransohoff Equipment!



End-loading, end-unloading mill. Castings cleaned twice; before sorting and grinding, after sorting and grinding ready for plating. Discharges onto inspection conveyor table. Power loader in pit.

Side-loading, side-unloading wet mill cleaning brass pump castings. Cold water is pumped through mill. Tumbling material usually brass crucible droppings.

about RANSOHOFF SERVICE

"The services of your organization in assisting us where quick delivery was necessary and in coming to prompt engineering decisions is worthy of high commendation."

about RANSOHOFF DESIGN

"The design of your machinery saves a great deal of manpower."

about RANSOHOFF EQUIPMENT

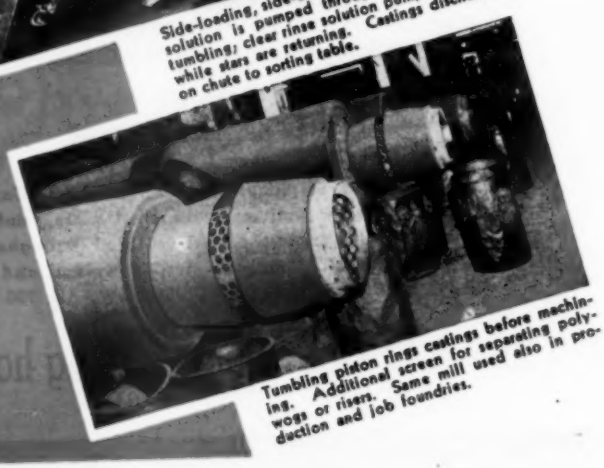
"This type of machine does an outstanding job, does it quickly and well."

"Maintenance of these machines has been extremely low."

"The equipment has proved very satisfactory."

"Equipment is well engineered, well constructed, running continuously with a minimum of maintenance and doing an excellent job."

Side-loading, side-unloading wet mill. A hot solution is pumped through the mill while tumbling; clear rinse solution pumped through while stars are returning. Castings discharged on chute to sorting table.



Tumbling piston rings castings before machining. Additional screen for separating polywogs or risers. Same mill used also in production and job foundries.

RANSOHOFF WET CLEANING MILLS

automatic star-return . . speedy . . gentle . . stars handled automatically throughout

SAVE 30% to 70%

Write for Ransohoff Engineers to call and discuss your cleaning problems.

REMEMBER: to economize, modernize!

N. RANSOHOFF, Inc.

TOWNSHIP & BIG 4 R. R.
CINCINNATI 16, OHIO

WHERE THE DEMAND FOR AIR IS CONTINUOUS...

WHEREVER the demand for air is continuous, a Gardner-Denver "HA" Two-stage Horizontal Compressor can best answer the need. For the "HA" has been engineered for continuous heavy-duty service . . . for dependable operation that stands up under tough emergency calls.

Horsepower requirements are unusually low with the "HA," and they are noted for their ability to establish remarkable maintenance records.

The sustained output of these compressors is due to better design and advanced manufacturing methods.

NOTE THESE "EXTRA" ADVANTAGES . . .

1 5-step capacity control (recycling) employing Clearance Pocket Control Valve of semi-balanced piston construction. Doubly protected from air leakage by both snap rings and beveled seat—no diaphragms. Since movement of parts is infrequent, due to recycling, life of valves is almost unlimited.

OTHER "HA" FEATURES

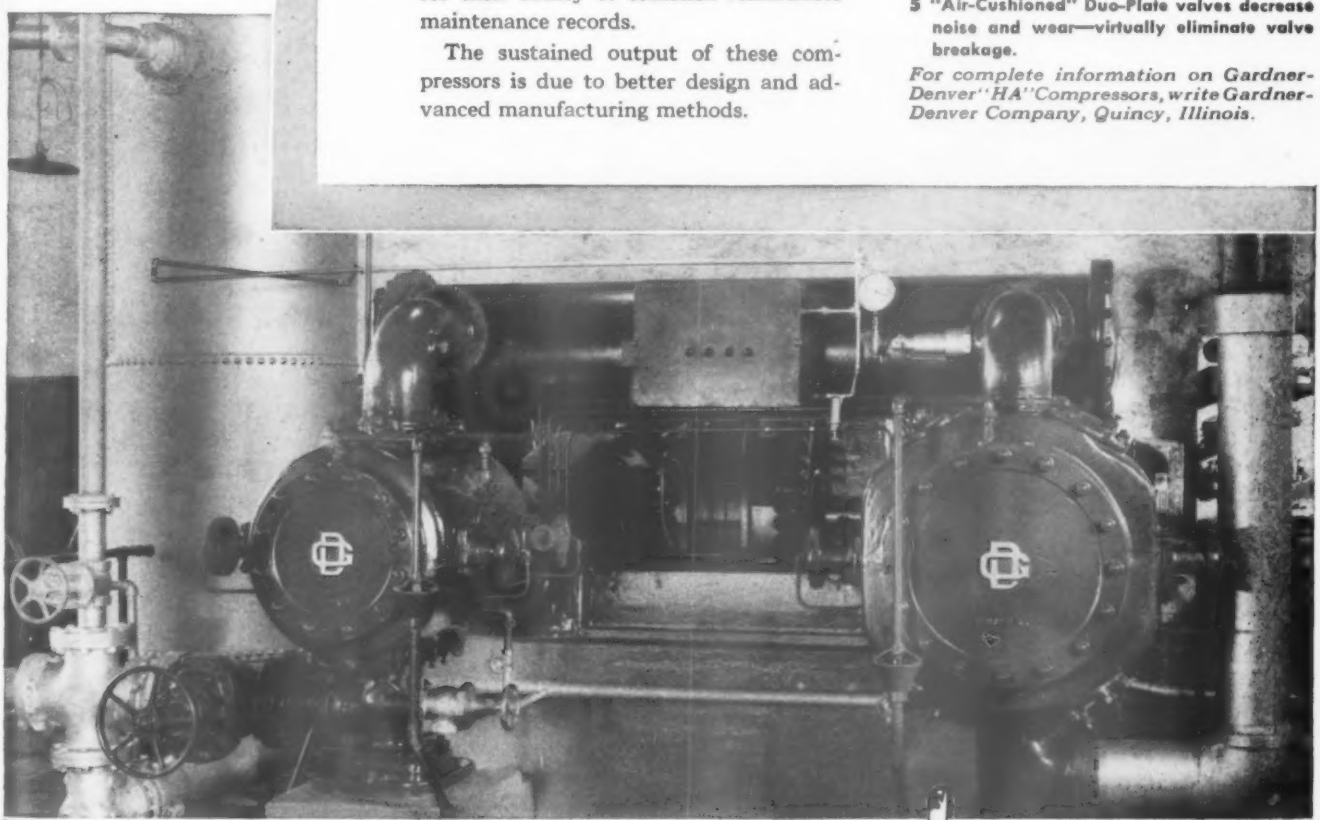
2 Timken roller main bearings for the life of the machine . . . eliminate shaft wear.

3 Unrestricted air passages and large valve areas assure high overall efficiency.

4 Larger water jackets assure cooler running compressor.

5 "Air-Cushioned" Duo-Plate valves decrease noise and wear—virtually eliminate valve breakage.

For complete information on Gardner-Denver "HA" Compressors, write Gardner-Denver Company, Quincy, Illinois.



GARDNER-DENVER

Since 1859

NORTH AMERICAN
SAFETY SHUTOFF VALVES
WILL CLOSE FUEL SUPPLY

●

WHENEVER
ANYONE SHUTS OFF AIR SUPPLY

●

WHENEVER
FUEL OR AIR PRESSURE FAILS

●

WHENEVER POWER FAILS

★

ONCE CLOSED THE VALVE MUST BE RESET MANUALLY, GIVING THE OPERATOR TIME TO CHECK THE TROUBLE AND PREPARE FOR PROPER RELIGHTING OF BURNERS

★

SIMPLE COMPACT DESIGN GUARANTEES DEPENDABLE OPERATION

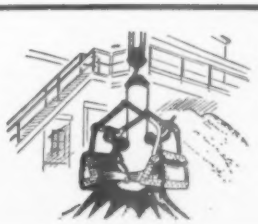
THE NORTH AMERICAN MANUFACTURING COMPANY
MANUFACTURERS OF INDUSTRIAL FUEL BURNING EQUIPMENT FOR GAS OR OIL
BRANCH OFFICES *with* FIELD ENGINEERS *in* PRINCIPAL CITIES
CLEVELAND 4, OHIO

BLAW-KNOX FOUNDRY BUCKETS

These Single-Line, Hook-on type buckets are designed to meet the wide range of requirements encountered in foundry work. The complete Blaw-Knox line of sizes and types permits a selection of the one best suited to your needs. . . . Extremely Low Head Room (as low as 6′ 7″). . . . Large Deck covering area for quick clean-up of foundry floor without digging into floor. . . . Adequate Digging Ability to handle steel foundry refuse that is more difficult to penetrate.

All Blaw-Knox Foundry Buckets have these important advantages as well. . . . (1) Automatic Dumping by crane operator at ground level or a predetermined elevation. (2) Complete Safety—because accidental dumping has been eliminated. (3) Opening shock eliminated through adjustable dead end. (4) Better performance through improved design. . . . For complete data on the type you require write for Catalog No. 1696.

BLAW-KNOX
DIVISION
OF BLAW-KNOX COMPANY
2097 Farmers Bank Bldg., Pittsburgh, Pa.



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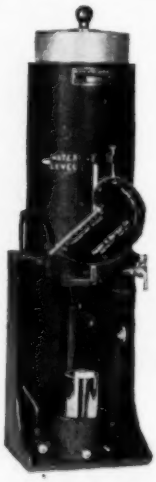

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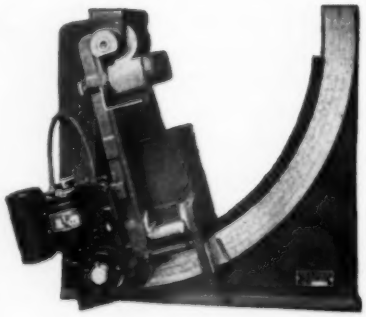

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ELECTROMET FERRO-ALLOYS AND METALS FOR THE FOUNDRY

Added to the Cupola	*Result*
EM Silicon Briquets (round)	Deoxidize and aid machinability by graphitizing effect. Reduce chill in light sections. Permit the easy control of silicon additions.
EM Chromium Briquets (hexagonal)	Increase hardness, wear resistance, corrosion resistance, and heat resistance. Promote greater density. Permit easy control of chromium additions.
EM Silicomanganese Briquets (square)	Act as a scavenger. Harden iron when added in large quantities. Permit easy control of manganese additions.
Added to the Ladle	*Result*
85% Ferrosilicon 50% Ferrosilicon	Deoxidizes and aids machinability by graphitizing effect. Reduces chill in light sections. (The 85% grade is used for large additions.)
Silicon-Zirconium	Deoxidizes and graphitizes, improving density of iron.
Ferromanganese-Silicon	Combines graphitizing influence of silicon with scavenging action of manganese.
Ferromanganese	Acts as scavenger. Hardens iron when added in large quantities.
Foundry-Grade SM Ferrochrome (Designed for rapid solubility)	Increases hardness, wear resistance, corrosion resistance, and heat resistance. Promotes greater density.
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SMZ Alloy	Converts normally hard iron into high-strength gray iron. Reduces chill. Improves strength and physical properties.
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Among the many Electromet products important to foundrymen are two ladle addition alloys — SMZ Alloy and SM Ferrochrome — which foundrymen are finding especially useful today.

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Get the latest information on EM Briquets

THE BRIQUETS with a 12-year service record

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The reason for this high recovery is the special binder *which will not burn* in passage through the cupola. Thus the alloy is protected all the way to the melting zone, and oxidation losses are kept at a minimum. Write for the booklet, "Briquetted Alloys for the Cast Iron Foundry."

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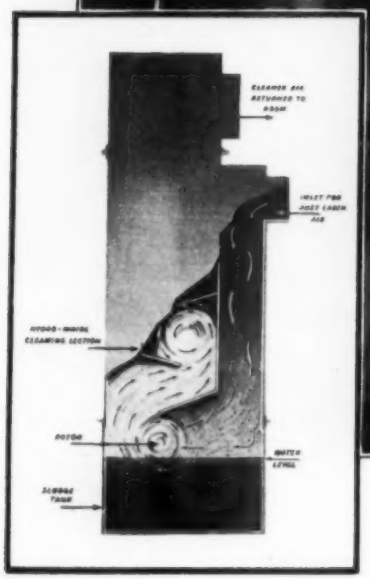
HYDRO-WHIRL

CONTROL Foundry DUST and FUMES



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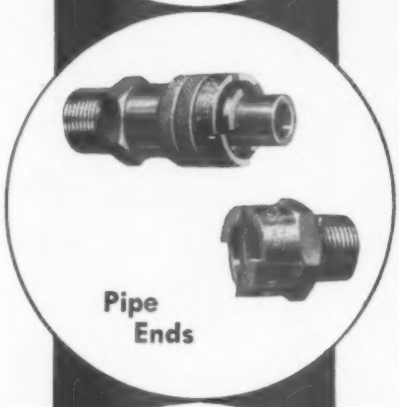

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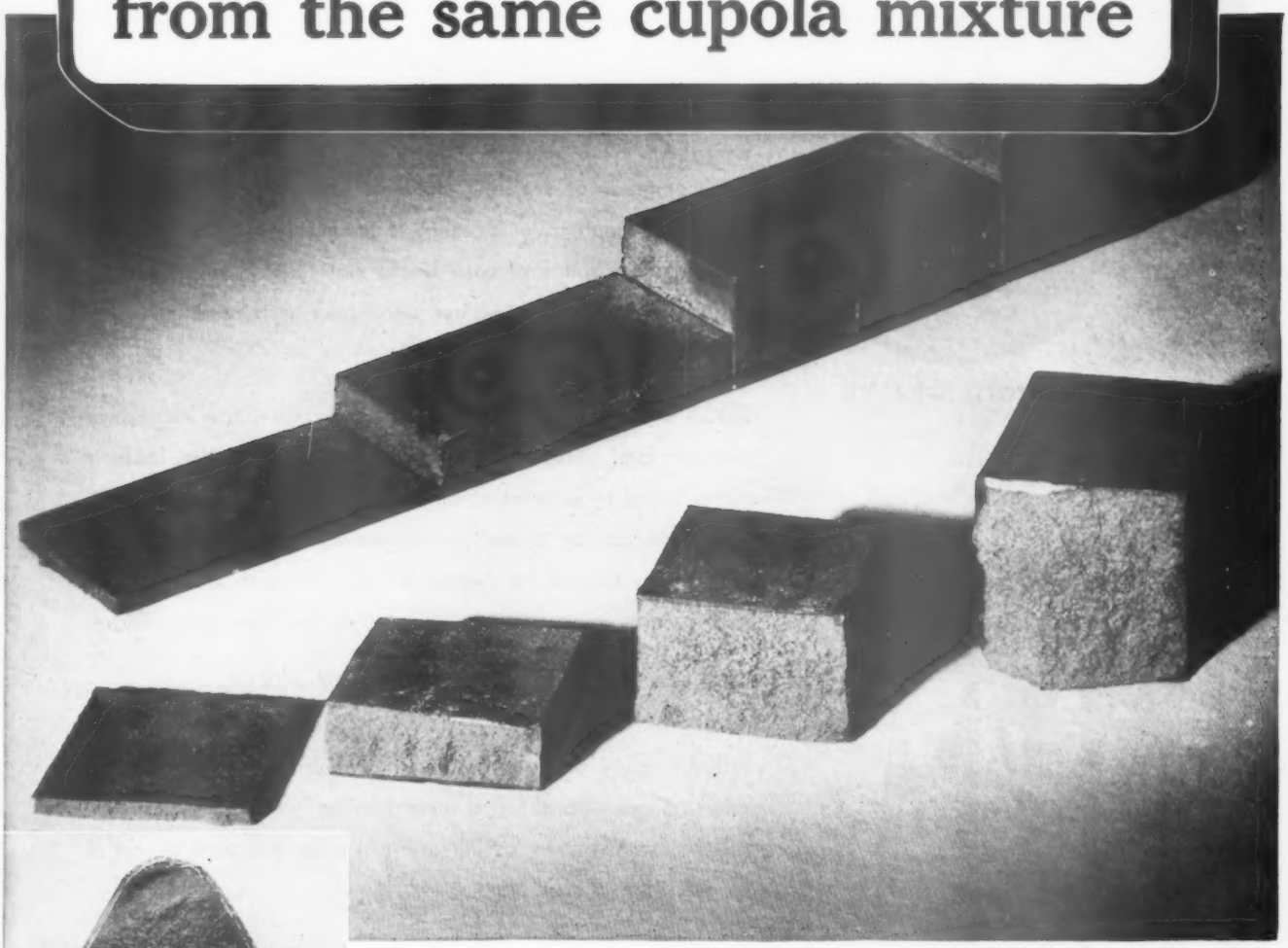
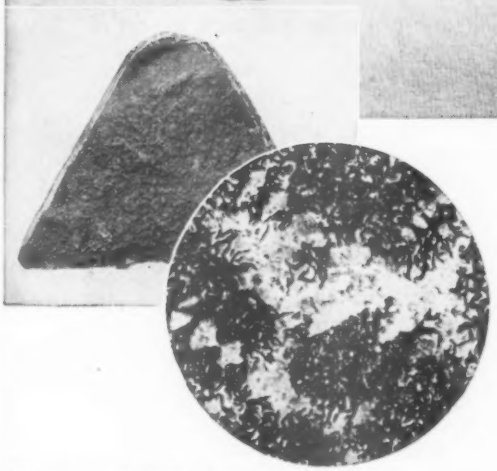
Casting thick and thin sections from the same cupola mixture





*G-Iron is graphitized pig iron. These photographs show its grain structure. *Circle:* Photomicrograph etched—100 diam. Manufactured under U. S. and Canadian patents.

Cupola mixture used and final casting results of the step-bar illustrated (metal thicknesses of ¼", 1", 2" and 3") are:

CUPOLA MIXTURE	CASTING RESULTS
40% G-IRON pig (silicon 2.40%)	2.04 Silicon
30% Returns	.102 Sulphur
30% Cast iron scrap	.434 Phosphorus
	.66 Manganese
	3.56 Total Carbon
	.40 Combined Carbon
	32,300 Tensile
	3,300 Transverse (12" centers—1.2" bar)

G-IRON* in a gray iron mixture of the same analysis produces sound castings with uniform grain structure over a wide range of metal thicknesses. The finely distributed graphite reduces chill in thin sections and increases fluidity—improves machineability and helps to overcome internal shrinkage and porosity between thin and heavy sections.

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BETTER FOUNDRY EQUIPMENT

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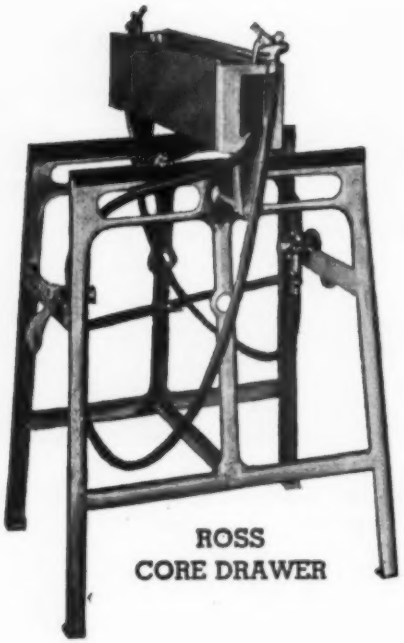
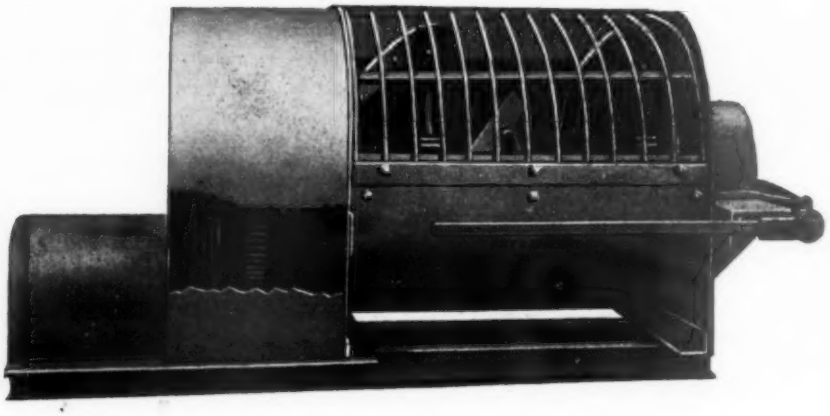
GAST CORE AND MOLD SPRAYER—This is a low-pressure, large jet atomizing sprayer, equipped with an air motor. It has a gear driven, paddle agitator for applying any type of wash to either green or dry sand molds or cores. It is regularly used with silica, naphtha or gasoline, talc and synthetic washes as well as the graphite or coke based materials. Wash is kept in suspension by paddle agitator when sprayer is used. Send for the whole story!

ROSS CORE DRAWER— If you are faced with a manpower problem (and who isn't?), remember that highly skilled labor is not required to draw cores on this machine and the more difficult boxes can be drawn just as fast as the easy ones. Many core boxes require no rigging at all. The Ross Core Drawer makes cores come true to size. Write for descriptive folder.



ROSS
CORE DRAWER

FREEMAN MULTI-BLADE FOUNDRY MIXER—Here is a mixer which has everything built-in as standard equipment, and includes many features not even available as accessories on other mixers. Send for a new booklet which explains how differently this mixer is built and just what you may expect of its operation in your plant.



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Industry Faces Problems of Both War Production and Reconversion

PATTERN of problems which will confront the foundry industry in 1945 gradually is taking form. A partial list would include such factors as continued government controls, manpower shortages, contract termination, reconversion to civilian production, returning veterans, competition for old and new markets, pricing, technical developments, and many others.

Results of the election indicate a continuation of certain restraints and controls which frequently in the past have hampered the foundry industry in achieving maximum production of castings for war.

Immediate major problem of the foundry industry continues to be the lack of manpower to produce castings in sufficient volume to meet critical war needs. The Gray Iron Foundry Industry Advisory Committee to the WPB recently indicated that "overall geographical manpower conditions are improving only slightly," although the "United States Employment Service offices are doing all they can in referrals to gray iron foundries." Reports to THE FOUNDRY from different sections of the country indicate the adverse publicity showered on the foundry industry during the summer by government agencies and officials has resulted in many of the USES referrals refusing foundry work.

Importance of the manpower problem is emphasized further by the fact the Ordnance Department still is holding foundries partly responsible for the lag in the heavy truck program. Recently an army ordnance officer in Detroit displayed four small malleable iron castings which he called "tremendous trifles" and indicated that shortage of these parts is one of the reasons for the critical and as yet unfilled overseas need for heavy trucks (page 122). If these four castings actually are holding up the heavy truck program, it would seem clear that proper priorities and intelligent scheduling would permit a single malleable shop to produce in a matter of days a sufficient tonnage to supply the entire heavy truck program for months to come. In this matter of castings production, it is interesting to note that the previously mentioned gray iron committee also reports "Visits to foundries by representatives of the armed forces and government agencies are excessive and consume too much time of industry executives and top operating men."

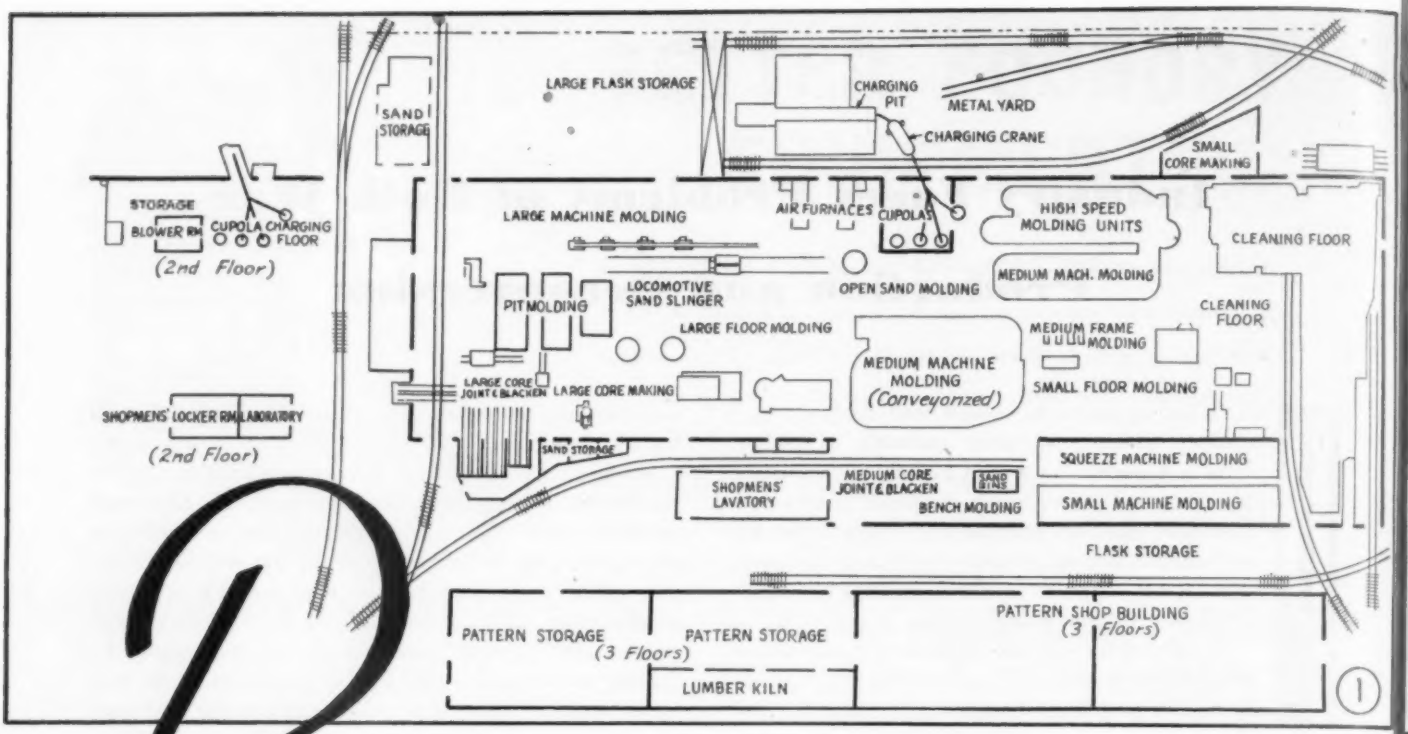
While that committee believes conversion to civilian production will not constitute a problem, it is altogether probable that piecemeal programs for reconversion necessitated by the prolongation of the war in Europe may create more complications than now are apparent. Furthermore, the continuation of the foundry manpower shortage may hold back the all-clear signal for partial reconversion, although a particular plant may have received heavy cutbacks in orders for war castings.

During the coming year the foundry industry will be faced with the problem of how best to employ discharged war veterans having varying degrees of disabilities. Special care and most intelligent handling will be necessary for these handicapped men who wish to return to foundry work, or who see in the industry an opportunity for advancement and economic security. The subject of returning veterans is so important that it should be made the matter of immediate committee study on the part of the various trade associations of the industry.

Perhaps in 1945 some of the government-owned foundries will be disposed of and available surplus government-owned foundry equipment will be offered for sale. It is to be hoped that these transactions may be completed on a basis which will be fair to the foundry and the foundry equipment industries, and to the government.

These and other problems which will confront the foundry industry may be as difficult as many encountered in the process of converting to war production. Intelligent leadership—in the plant, in the various foundry centers, and in contacts with government agencies—is essential to the development of solutions which will permit foundries to grow and better serve a civilization of the postwar world. The various associations serving foundries will have a tremendous part to play in providing this leadership. All have proved their worth for particular phases of industry development, and therefore deserve the complete support of the thousands of companies which make up the basic foundry industry.

Frank G. Steinebach
Editor



Redesigning a Foundry for Maximum Efficiency

By R. W. BIERWAGEN
Manufacturing Engineer
Westinghouse Electric & Mfg. Co.
E. Pittsburgh, Pa.

THE NEED for application of production methods and installation of labor saving machinery in the foundry has been emphasized by the demand created by the war for castings. A revamping and expansion program has recently been completed at our Trafford, Pa., gray iron foundry which has resulted not only in higher production but in an increased flexibility of product.

As can be seen from the above layout at the left (Fig. 1) showing the foundry as it existed prior to the construction of the additional facilities, very few mechanical aids to foundry work were in existence and those that did exist were built around high activity castings.

The general idea pursued in the planning of the revamping program was to attack the problem from the following angles:

1. Produce straight line flow of the materials going into the founding of castings.
2. Provide mass production facilities adaptable to jobbing orders.
3. Provide necessary control facilities for maintaining a uniform product and a reduction in defective castings.

That these objectives were accomplished is readily apparent from a study of the new layout shown in Fig. 2.

While this revamping program was being carried out, production had to be maintained at a high level on existing equipment. This meant that many makeshift arrangements had to be installed and later torn down after the final installation was completed.

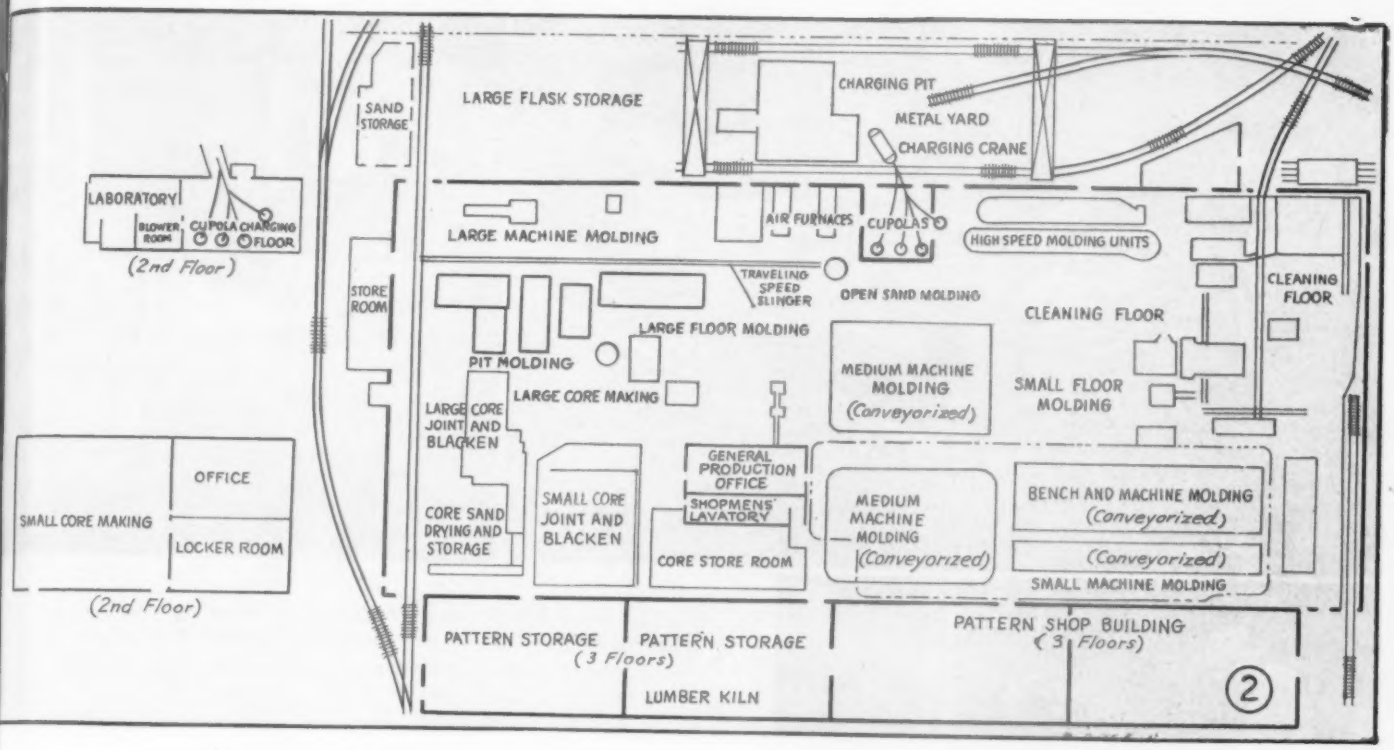
The first unit to be installed after the building was partially completed was the core sand unloading, drying, storage, and mixing equipment. This consists of a track hopper and grate over which the core sand is dumped from bottom dump cars. An apron then feeds the sand onto a belt which discharges into a rotary gas fired dryer (Fig. 3). From the dryer, the sand is dumped onto a screen used for removing the refuse, and then into an

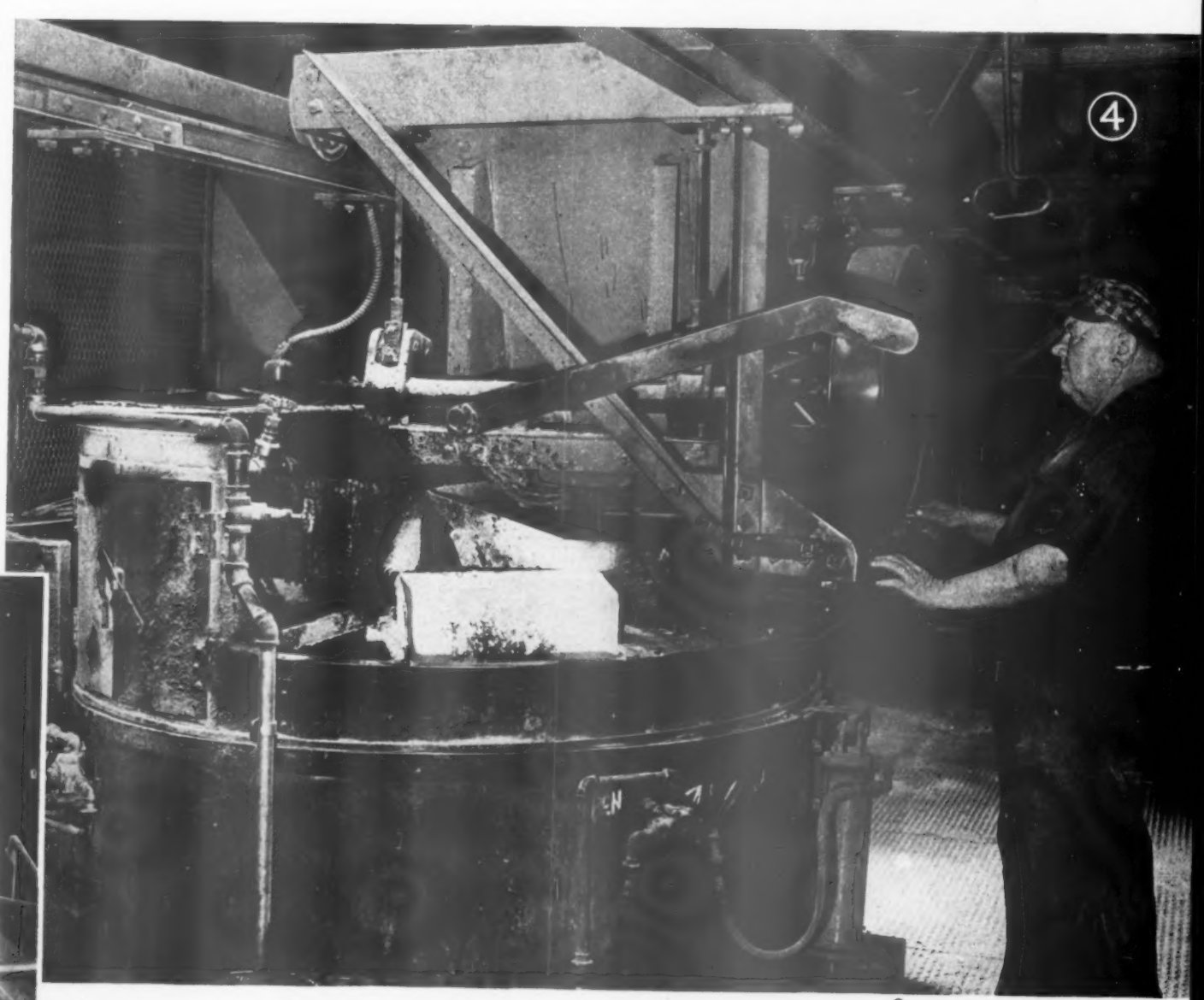
Fig. 1 (left above)—Layout of foundry before modernization

Fig. 2 (right above)—Showing foundry layout after modernization

Fig. 3—Sand, after being dumped from railroad cars through an open grate, travels on belt conveyor to rotary, gas-fired dryer

Fig. 4—From storage bins, sand is weighed and discharged into mills


LABORATORY
BLOWER ROOM
CUPOLA CHARGING FLOOR
(2nd Floor)
SAND STORAGE
LARGE FLASK STORAGE
CHARGING PIT
METAL YARD
CHARGING CRANE
LARGE MACHINE MOLDING
AIR FURNACES
CUPOLAS
HIGH SPEED MOLDING UNITS
STORE ROOM
TRAVELING SPEED SLINGER
OPEN SAND MOLDING
CLEANING FLOOR
CLEANING FLOOR
LARGE FLOOR MOLDING
PIT MOLDING
MEDIUM MACHINE MOLDING (Conveyorized)
SMALL FLOOR MOLDING
LARGE CORE MAKING
LARGE CORE JOINT AND BLACKEN
OFFICE
SMALL CORE MAKING
LOCKER ROOM
(2nd Floor)
GENERAL PRODUCTION OFFICE
SHOPMENS' LAVATORY
SMALL CORE JOINT AND BLACKEN
CORE SAND DRYING AND STORAGE
CORE STORE ROOM
MEDIUM MACHINE MOLDING (Conveyorized)
BENCH AND MACHINE MOLDING (Conveyorized)
(Conveyorized)
SMALL MACHINE MOLDING
PATTERN STORAGE (3 Floors)
PATTERN STORAGE
PATTERN SHOP BUILDING (3 Floors)
LUMBER KILN
2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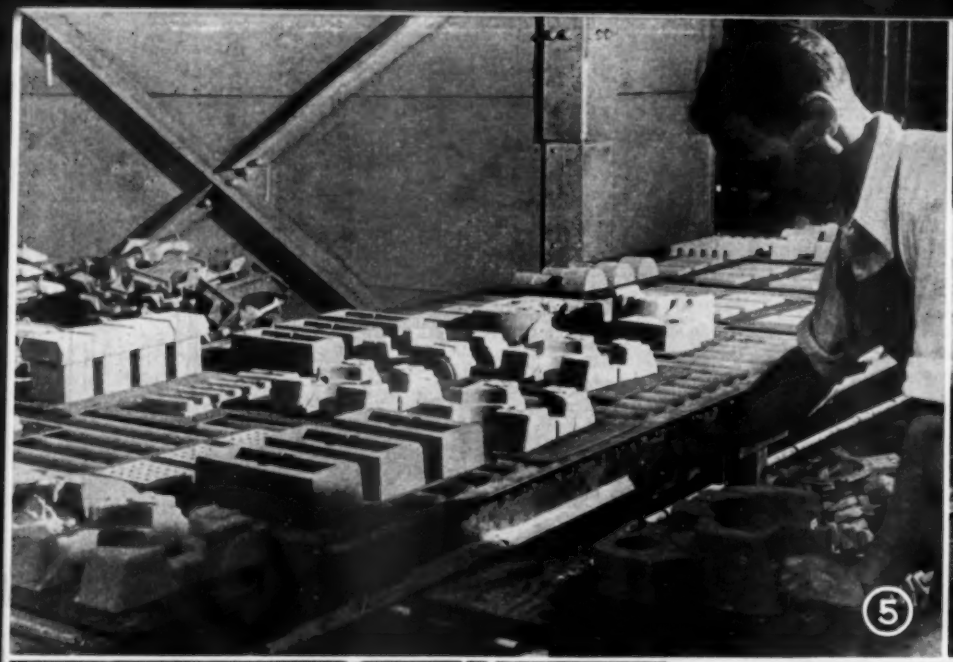


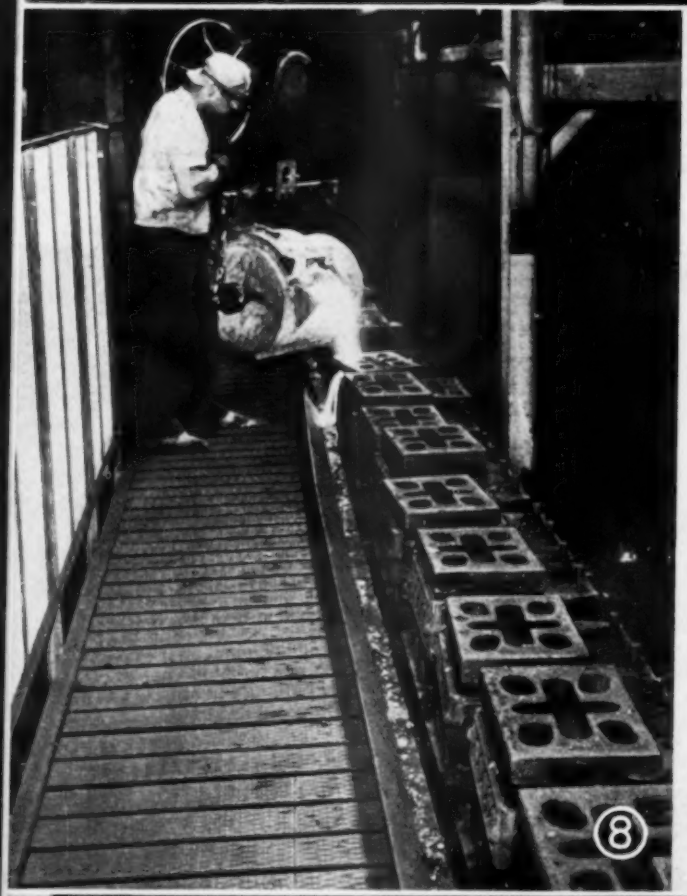


Fig. 5—Small bench cores are carried to ovens by powered roller conveyor. Electric stop mechanism turns off conveyor power when one of the plates reaches the oven

Fig. 6—Cores from small blowing machines go to oven attendant on this hand-operated, rotary table

Fig. 7—Larger machine molds, poured by overhead crane, are carried by overhead crane to shakeout. Castings travel by apron conveyors to central shakeout

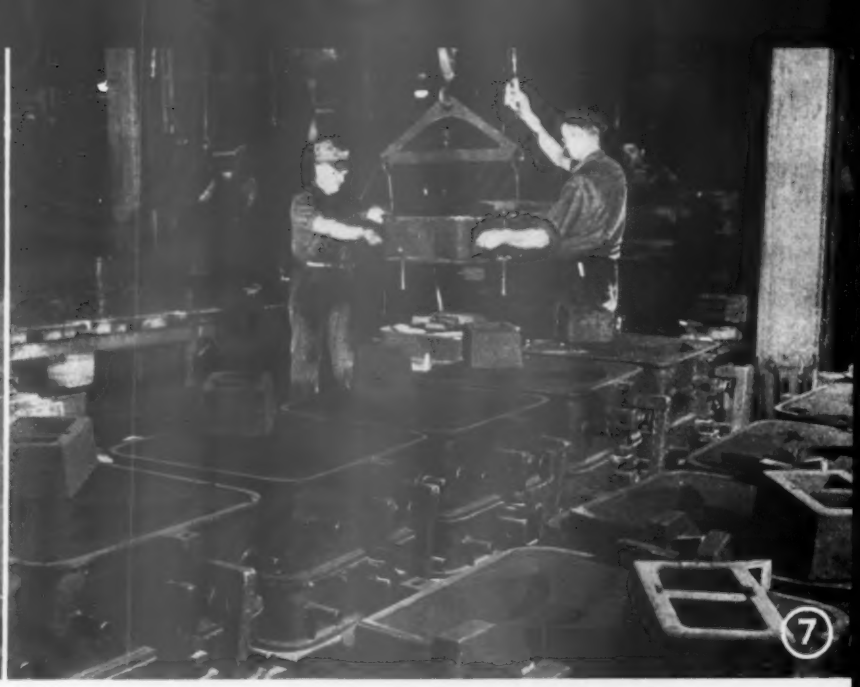
Fig. 8—Small flask unit on main molding floor is arranged so that molds can be poured on this pouring conveyor. Metal is brought from the furnace to pouring station by electric trucks

Fig. 9—Castings from small flask unit and larger machine molding unit share this central shakeout

Fig. 10—This four-station drag machine handles larger high production castings. It is one of few such types in existence in this country today

Fig. 11—Turntable with four stripper machines produces copes for drags made on four-station machine

Fig. 12—Shakeout for 26-inch and 32-inch square molds is equipped with dust collecting system to carry away smoke and dust. One entire bay, consisting of small flask unit and sections of high production unit, contains air cleaning equipment. As a result, smoke and dust are reduced to minimum



elevator. The elevator discharges onto a distributing belt over the storage bins which have a total capacity of 500 tons.

A mixing platform is provided under these storage bins on which two core sand mullers are located together with the necessary bins for core sand binders. Arrangements have been made through the use of a weigh larry, which can reach any of the storage bins, for weighing the batches prior to loading the sand mills, as shown in Fig. 4. The binders are weighed on a dial scale and the water and oil are measured by means of meters. From the sand mullers, the core sand is then distributed to the bench and core machines through the use of a skip hoist and distributing platform. Core sand for the larger cores is delivered to the floor with the use of an electric truck.

A unique feature of the core sand preparation equipment is the core sand testing equipment which is located on the mixer platform. Periodic routine tests are made of the various core sand mixes used under the supervision of the central foundry laboratory.

The core room has been divided into three main divisions for better supervision and control. The small bench and blow machine cores are made on a second floor and are moved to the vertical type ovens by means of a powered roller conveyor or hand operated turntables (See Figs. 5 and 6).

The area below the second floor is devoted to unloading of the vertical ovens and the assembly of cores. In this area also is located a horizontal paste drying oven used for final drying of completed cores.

The third division in the core room is the large core floor where the larger core boxes are handled by cranes and the cores are dried in two gas-fired, car type ovens.

The molding floor is divided into the following units:

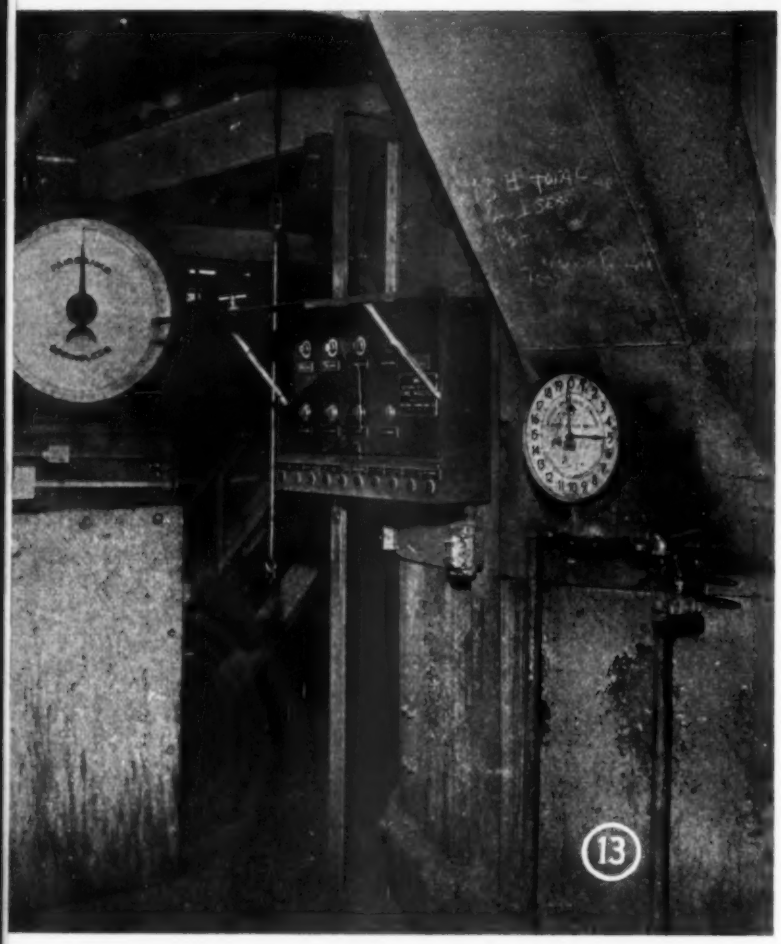
1. Small flask unit consisting of 12 squeezer stations, power mold conveyor, pouring conveyor and tilting shakeout (Figs. 8 and 15).

2. Roller conveyor floor for bench and larger machine molds up to and including 22x22-inch square flasks (Fig. 7). The molds after pouring are dumped on an apron conveyor which delivers the castings to a central shakeout (Fig. 9).

3. Power mold conveyor for high production castings taking 26x26-inch and 32x32-inch square molds. This unit consists of a four-station drag machine (Fig. 10), a turntable with four stripper machines for copes (Fig. 11), two sandslingers, and two shakeouts (Fig. 12).

4. Roller conveyor unit for job lot production of molds ranging from 26x26-inch square to 44-inch diameter. This unit consists of three rollover machines for drags, three stripper machines for copes, two slingers, and one shakeout.

5. Turntable unit with four small rollover machines for drags and four small stripper machines for copes. The



flasks, filled with a swing slinger, range from 18 inches square to 17x36 inches in size and are poured on a powered mold conveyor. This unit produces mainly small motor castings in large quantities.

6. Molding unit for production of the larger molds ranging from 36x54 inches to 48x72 inches. This unit consists of a stationary sandslinger (See Fig. 14), roll-over machine, and a shakeout.

7. Large flask and pit molding section. This section produces the largest castings required of the foundry and will shortly be provided with a traveling sandslinger of sufficient coverage to fill the pits and the flasks located in this section.

The first three units described are serviced by a central sand conditioning unit consisting of four 80-ton return sand bins, eight 2-ton binder and seacoal bins, four mixers with automatic cycle controllers and the necessary belt conveyors to move the sand from the mixers to the molding machines and to return the sand from the shakeout stations. The necessary screening equipment is also included in this unit.

The automatic cycle controllers (Fig. 13) on the mixers are so arranged as to control the following operations:

1. Charge sand into mullers.
2. Add binders and sea coal.
3. Dry mixing.
4. Add water.
5. Wet mixing.
6. Discharge muller.

All of the other units are served by individual mullers with manual control at the present time, although the two sandslingers for the larger molds will eventually be supplied from a central sand conditioning unit similar to the unit previously described.

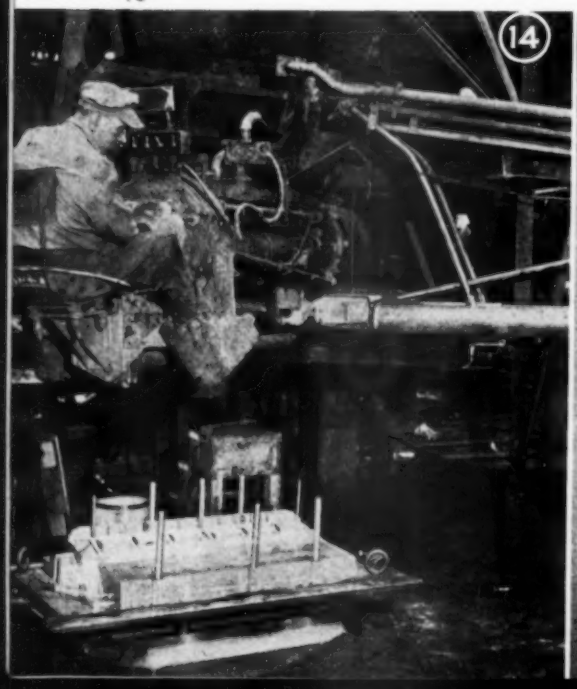
The cleaning floor has been arranged in small individual divisions adaptable to the finishing of castings produced in the various molding units.

Smaller castings are cleaned in rumbling barrels of abrasive machines and are then ground on stand grinders or chipping benches.

The medium sized castings are cleaned in a three-wheel monorail type abrasive cabinet and are then ground with the use of swing grinders. Any chipping operations required are performed on either the floor or bench.

Large castings are cleaned with the use of a water blast and room type shotblast. (*Please turn to page* 106)

Fig. 13—*Four large sand mills, located on main molding floor, are equipped with automatic sand, water and oil charging equipment. Shown are one of the mills and control panel. Fig.* 14—*Stationary sand slinger is vital part of large molding unit. Fig.* 15—*Tilting shakeout for small flask unit requires no attendants. In background can be seen first squeezer station*



Wage Incentive Plans IN FOUNDRIES

By WILLIAM H. SPENCER
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THERE is nothing novel or mysterious about wage incentive plans. They are simply methods of rewarding workers with increased pay for production above that which is normally expected from daywork. When increased effort or a more productive use of effort will bring increased earnings the result is more production per man-hour. This has been demonstrated repeatedly both in peace and war times. The average increase in productivity in various industries has been in the neighborhood of 40 per cent within 90 days of the installation of a wage incentive plan.

When a reasonable standard based on careful study and facts is established with a suitable reward offered for increased productivity, it is usually acceptable to the workers. A clear understanding of the plan by everyone and good labor relations are also necessary to achieve the best results. If these primary conditions are not met, a wage incentive plan may not increase production and may even decrease it. Even the soundest of wage incentive plans cannot be expected to be free of discussions and grievances, for a certain amount of these will arise with any wage payment method. However, if the plan is fundamentally sound and is given continuous capable supervision it will yield good results with a minimum of trouble.

Wage incentive plans must have War Labor Board approval and the National and Regional War Labor Boards have stated certain policies and rules for incentive wage plans. The adoption of an incentive wage must be voluntary and will not be ordered in a dispute case. If there is a recognized bargaining agency for the employes covered by the plan, both management and labor representatives must sign the Form 10 application. The WLB determines only whether the plan conforms to the national stabilization program, not assuming responsibility for the technical details.

The decision as to the technical details of the plan remains with the individual management. The conditions and requirements of each plant or department should determine the exact details to be used. However there are certain general principles which are applicable to any sound wage incentive plan, and certain types of plans and methods from which the most suitable may be chosen.

The units used should be accurate measures of the productivity and effort of the workers. These units may be time per piece, money per piece, pieces per hour, pounds per hour or other suitable measure. The use of dollar sales volume or of time estimates based on personal judgment as measures of productivity is difficult to justify and has repeatedly led to failures.

The production standard should fairly represent the amount of work performed per unit of time by a normal, qualified operator under normal conditions. Standards set too tightly will result in prompt complaints, but those set too loosely are not so readily detected as they may result in restricted production to control earnings.

A base rate should be guaranteed which will be the minimum paid per hour on the job regardless of productivity. This rate ordinarily is the employes' basic hourly rates which existed prior to the plan.

Once the incentive rates for increased productivity is definitely set it should be guaranteed against change unless there are changes in methods, materials or product, and in such cases it should be understood that they will be promptly and equitably changed. If soundly based rates are reduced without cause the incentive plan becomes worthless and a mere source of trouble. On the other hand, if rates are not corrected for changes in methods, materials or product they become inequitable and also cause dissension.

The wage incentive plan should be as simple as possible without involving injustices. Employes should understand the plan and how their efforts will affect their earnings. They should also be kept informed constantly of their earnings.

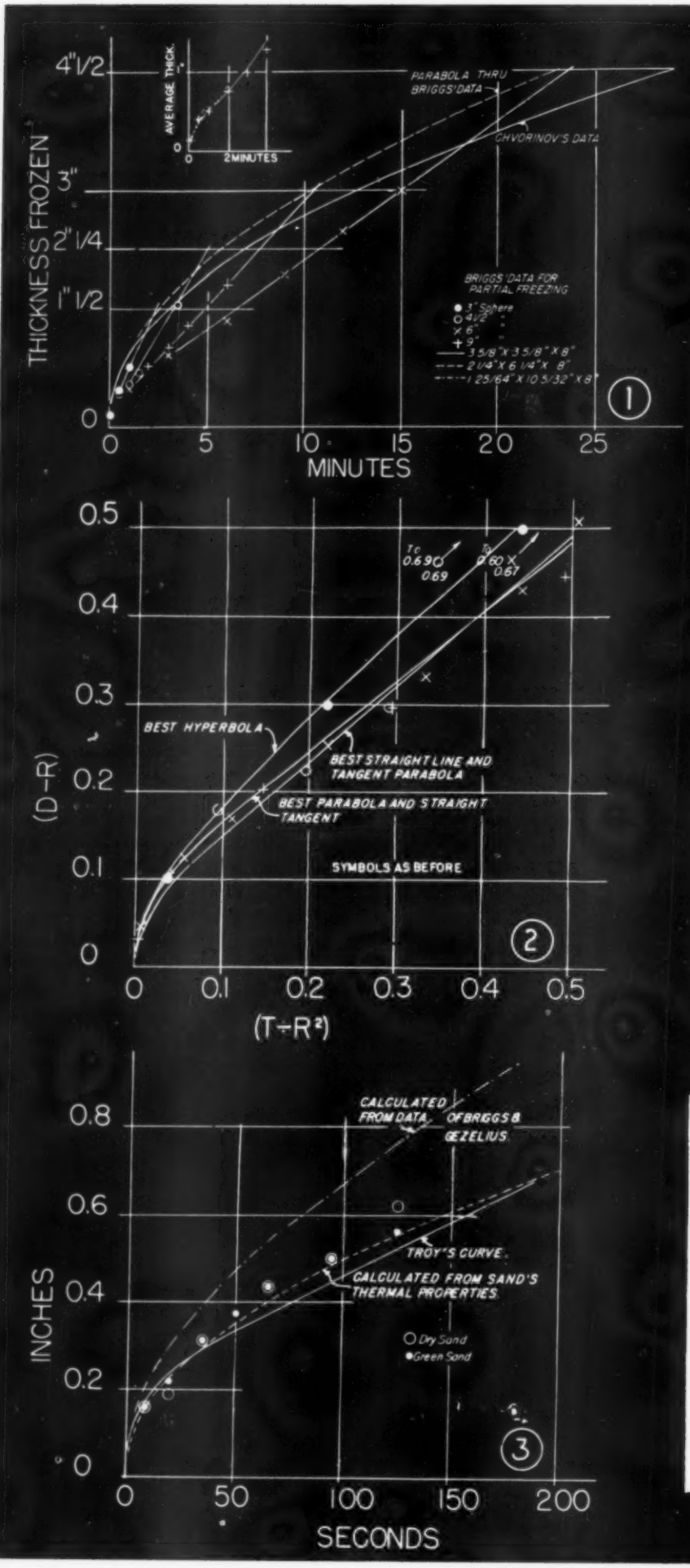
The exact description of the work or operations covered and any changes in the job content and rate should be understood by all concerned.

The plan should increase production per man hour without appreciably increasing the unit labor cost of the operations performed by the workers to whom the plan applies.

Wage incentive plans may be divided into types on several different bases which we will consider next.

An individual plan pays on the production of each worker. It probably is the most effective method for increasing productivity, since the worker receives an incentive based upon his own effort. However, this may give rise to jealousy or it may be difficult to measure each worker's production.

A group plan pays the individuals either equal or proportionate shares of the incentive pay earned by the entire group. It is used most effectively where each worker contributes a fixed amount to the operation but may be extended to groups who work (*Please turn to page* 223)



The author discusses various experimental work on rate of solidification of steel castings. He suggests that variations in these findings and acceleration in freezing rate with passage of time may be accounted for by the contribution made by radiation and convection on apparent thermal conductivity

HOW fast do metals freeze? The foundryman would like to know, in order to arrange for proper feeding. Chvorinov, at the last International Foundry Convention in London in 1939, said that the time for complete freezing of any steel casting in "chamotte" is proportional to the square of the quotient when the casting's superficial area is divided into its volume. The time is believed to be otherwise independent of the casting's size or form, though doubtless there would be some limitation on the complexity. Quantitatively, the time would be $12.5\left(\frac{V}{A}\right)^2$, using the inch as the unit of length and the minute as the unit of time.

This may be all very true, but the foundryman wishes to know also how far freezing has advanced at various times before the process is complete. Perhaps the best experimental work on this subject which has been published is in a paper by Briggs and Gezelius, "Rate of Skin Formation in Steel Castings," *Transactions* A. F. A. XLIII, p. 274, 1935. Unfortunately, they fell into demonstrable error in interpreting and generalizing their results, but their observations seem very reliable.

Since from the geometry of the sphere $\frac{V}{A} = \frac{R}{3}$, the freezing times of Briggs and Gezelius' 9, 6, 4½ and 3-inch diameter spheres should have been, according to Chvorinov, 28 minutes, 12½ minutes, 7 minutes and 3 minutes. Briggs and Gezelius' equations for D, the thickness of frozen metal in spheres of various sizes, when extrapolated to values of D equal to the radius, give 25, 12 and 2.5 minutes for 9, 6 and 3-inch spheres, agreeing rather well with the Czech investigator. Extrapolating what appear to be straight lines in their individual diagrams the Naval Research Laboratory data represent freezing times of about 23 minutes, 10½ minutes, 4½ minutes and 2¼ minutes, agreeing as might be expected quite well with the extrapolation by the equations based on the same data. However, using the same author's generalized curve (Fig. 5 of the reference) the times for complete freezing are, reading the ordinates equal to $\frac{R}{3}$, 6 minutes for the 6-inch sphere, 3½ minutes for the 4½-inch sphere and 1½ minutes for the 3-inch sphere, at which times their observations showed the 6-inch sphere to have a solid shell about 1.8 inches thick, the 4½-inch sphere about 1.6 inches thick and the 3-inch sphere, by extrapolation, about 1 inch thick; all instead of being frozen solid.

Fig. 1—Curves showing relationship of thickness of metal frozen and time from data of Briggs and Gezelius, and Chvorinov

Fig. 2—Replot of Briggs and Gezelius data using D/R as the ordinate and T/R^2 as the abscissa where D is thickness of frozen layer, R radius of sphere and T is time

Fig. 3—Comparison of data of Troy on green and dry sand, and of Briggs and Gezelius

The error lies in the authors' unconscious exclusion from their table of values for which the times lie beyond the limit where the relation of time to depth frozen ceases to be quadratic. Evidently we must not base any conclusions on Fig. 5 of the paper, which does not reproduce the author's own freezing times, even approximately, but we may well use their observational data and draw our own conclusions. The first of these is that, with some alteration in the constant, their data conform to Chvorinov's dictum. The difference is not so surprising, having in mind that the Americans used "dry sand," the Czech "chamotte," and that the former measured an interface temperature of about 2300 degrees Fahr. and the latter estimated and confirmed one of about 2750 degrees Cent. The temperatures differ in the wrong direction to be solely responsible for the difference in results.

Although we are constrained to reject the Briggs and Gezelius generalization, it is quite possible to substitute others, more consistent with their facts, which will be applicable to spheres only. An inspection of their data, plotted in Fig. 1, together with Chvorinov's, suggest that if the radius of the sphere be taken as the unit of length and the time for complete freezing as the unit of time, the curves for all sizes of spheres would be nearly superimposed. Since the time for complete freezing varies inversely as the radius of the sphere it is equally convenient, while avoiding any assumption as to the proper constant of proportionality to re-plot, as in Fig. 2, their individual observations, using D/R as ordinate and T/R^2 as abscissa. D is the thickness of the frozen layer, R the radius of the sphere and T the time.

Well Represented By Single Curve

The supposition that the observations for all sizes of spheres would be equally well represented by a single curve is indeed pretty well supported by the figure. It is next important to determine the equation of the line which best fits the plotted points. The loci of the original paper suggest a parabola near the beginning of freezing, followed by a line tangent thereto. If Chvorinov's data were applicable to partial freezing, a single parabola would be indicated. However, a parabola passing through the origin and through any possible value of $\frac{T}{R^2}$ for complete freezing (when $\frac{D}{R} = 1$) falls entirely to the left and above the array of points, indicating much shorter freezing times than were observed.

The plotted points indicate a transition from a curve to a straight line in the neighborhood of $\frac{T}{R^2} = 0.1$. Computing, by least squares, the equation of a parabola best fitting the points corresponding to shorter times and of a straight line for longer times, we get

$$\frac{T}{R^2} = 3.608\left(\frac{D}{R}\right)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$\frac{D}{R} = 0.06412 + 0.8548\,\frac{T}{R^2} \quad \ldots\ldots\ldots (2)$$

Be it remembered that the units are the inch and the minute. These two lines are (*Please turn to page* 236)

SELECTING for Magnesium Molding

Various types of reactions which occur when molten magnesium enters a sand mold, and methods of correcting them, are discussed in this first of two articles on addition of inhibitors to sand

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IT IS well known among foundrymen that liquid magnesium is reactive and requires the addition of *inhibitors* to the sand to prevent the reaction of the metal with its environment while it is still liquid in the mold cavity. Normally, inhibitors are added to prevent *sand reaction*. This is a misnomer, for sand reaction

$$(1)\quad Mg + SiO_2 \rightarrow MgO + Si$$

rarely occurs, and only when very hot metal passes over a certain portion of the mold, heating the sand to a high temperature. Fortunately, the sand must be heated unusually hot to start this reaction.

The principal function of the inhibitors is to prevent the reaction:

$$(2)\quad Mg + H_2O \rightarrow MgO + 2H$$

and to a much less extent to prevent the reaction with oxygen and nitrogen:

$$(3)\quad 2Mg + O_2 \rightarrow 2MgO$$

$$(4)\quad 3Mg + N_2 \rightarrow Mg_3N_2$$

It is generally believed that an inhibitor functions (1) by forming a protective skin on the melt (2) by forming an inert atmosphere or, at least, a less reactive one, or (3) by coating the sand particles with a nonreactive substance. It is quite likely that the first of these functions is of most importance, the second only slightly effective, and the third serves only as a safety factor which is generally not required. The first two must necessarily function simultaneously. According to Pilling and Bedworth, (*Journal*, Institute of Metals, 1923, Vol. 29 pp. 529-581), the protective character of an oxide film is a function of the relative density of the oxide and the metal taking part in the reaction as expressed in terms of specific molecular volume. If the protective coefficient is under 1, that is, if the ratio—specific volume of the reaction product or products divided by specific volume of the metal—is less than unity, the reaction products are not protective.

Delavault (*Light Metals Review*, September, 1943) confirmed this theory on the basis of the reactions and protective coefficients given in Table I for magnesium melts.

Sulphur should be an effective inhibitor because its protective coefficient is 1.26. This conforms to foundry experience because sulphur effectively retards burning when it is dusted onto the metal surface. When it burns off and SO_2 is formed, the metal may then begin to burn because the protective coefficient for SO_2 is 0.92. However, the film formed with SO_2 is considerably more protective than that formed by the reaction with the atmosphere. Accordingly, it should be noted that the sulphur vapor generated in the mold cavity and in the sand adjacent to the melt is considerably more protective than SO_2 which is formed by the reaction of the sulphur and atmospheric oxygen in the mold.

Nitrogen does not provide much protection and this is substantiated by the theory. The good protection afforded in practice by the use of fluorides is also supported by the theory of Pilling and Bedworth.

Calculations of the protective coefficients for CO and CO_2 are based on the use of the specific volume of carbon, since it is a solid reaction product. This means that the carbon formed is considered part of the protective film along with the MgO formed in the reaction. Obviously, the finely divided carbon particles may partially or completely burn out of the protective film, in which case the protective coefficient would be lower

Table I—Calculated Protective Coefficients of Inhibiting Agents

		Protective Coefficient
(3)	$Mg + O = MgO$	0.71
(5)	$Mg + CO_2 = MgO + CO$	0.71
(4)	$3Mg + N_2 = Mg_3N_2$	0.79
(6)	$2Mg + CO_2 = 2MgO + C$	0.90
(7)	$3Mg + SO_2 = MgS + 2MgO$	0.92
(8)	$Mg + CO = MgO + C$	1.08
(9)	$Mg + S = MgS$	1.26
(10)	$3Mg + 2BF_3 = 3MgF_2 + 2B$	1.32
(11)	$Mg + 2HF = MgF_2 + H_2$	1.32
(12)	$3MgO + 2BF_3 = B_2O_3 + 3MgF_2$	3.1

...G INHIBITORS

...ng Sand

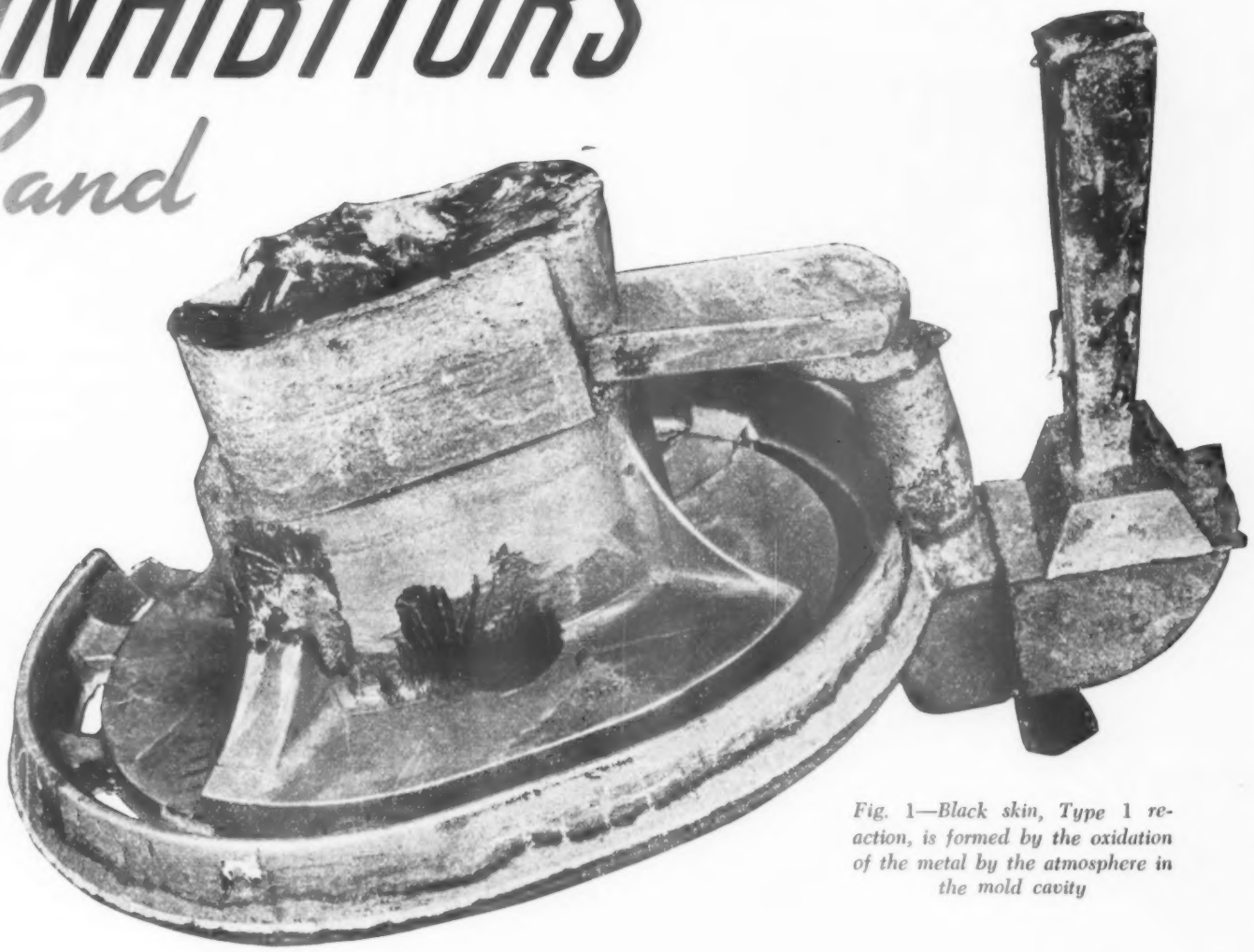


Fig. 1—Black skin, Type 1 reaction, is formed by the oxidation of the metal by the atmosphere in the mold cavity

than those indicated in Table I for Equations (6) and (8). This would account for the rather lower protection afforded by CO_2 in actual practice than that indicated by the protective coefficients. This is not a refutation of the Pilling and Bedworth theory, but merely that the specific volume of the carbon formed when magnesium reduces CO_2 and CO should not be used when calculating the protective action of the film formed on the melt.

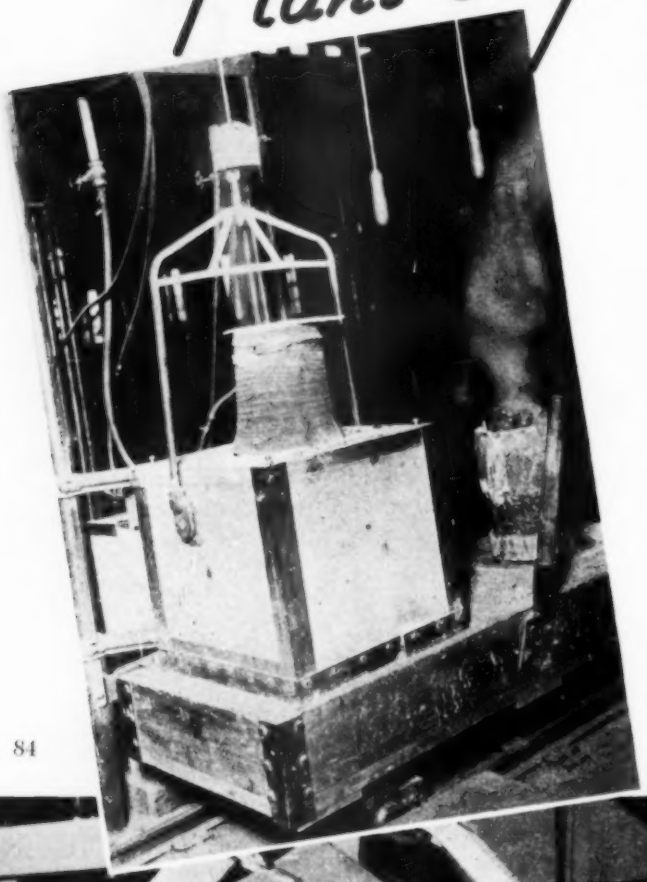
Burning, involving the reaction of molten magnesium with the atmosphere over it, once begun accelerates itself. Thus, if burning begins at a certain location on the melt surface, this area will serve as a center from which the burning will spread quite rapidly unless it is retarded by special means. This acceleration may be caused by (1) the increased surface exposed and greater accessibility of the melt surface to the atmosphere, (2) the localized high temperature produced as a result of the oxidation, (3) the burning of the atomic hydrogen released by the reaction, or (4) any combination of these factors. It is noteworthy that the nonprotective films break up, become lumpy, and oxidation continues rapidly through them. On the other hand, the protective films remain substantially smooth and continuous, retarding or preventing further oxidation. If the latter type of film is broken, a reaction occurs with the inhibitor, if any is present, reforming the protective film.

There are in general three types of *reaction* or *burning* defects on magnesium sand castings. The first frequently is called *black skin* and forms by the reaction of the magnesium with the atmosphere over it. The formation of the black skin, Fig. 1, frequently can be observed in the mold cavity by peering down the risers. It may form in the runners or in the mold cavity itself and is produced, or at least initiated, by the reaction of the magnesium with moisture in the atmosphere in the mold cavity. Its formation is favored by:

1. High atmospheric humidity.
2. High water content in the sand.
3. Heavy sections.
4. High pouring temperatures.
5. Inhibitors which are inadequate.
6. Agitation which initiates the burning.
7. Pouring conditions which permit a long time interval for the magnesium to remain liquid in the mold cavity.

Heavy chills accentuate the difficulty because the moisture condensation on them may initiate the reaction, and because the chilling effect entraps the tough black skin in the melt in the mold cavity, thus producing a defective casting. Indeed, it is (*Please turn to page* 232)

Plant Layout for High Frequency



BY COMBINING up-to-date material handling techniques, good plant layout, and high frequency melting, numerous modern alloy steel and nonferrous metal foundries are achieving cleanliness, comfort, and smooth-flowing production of uniform, clean, precise-composition castings with low metal loss.

High frequency furnaces can be located right on the pouring floor, thus permitting more compact layouts, reducing material and mold travel, and simplifying the pouring operation. Also, the flexibility of a compact group of furnaces of different sizes makes easy, quick changeovers from one alloy to another or from one size melt to another. It is the purpose of this article to set forth the

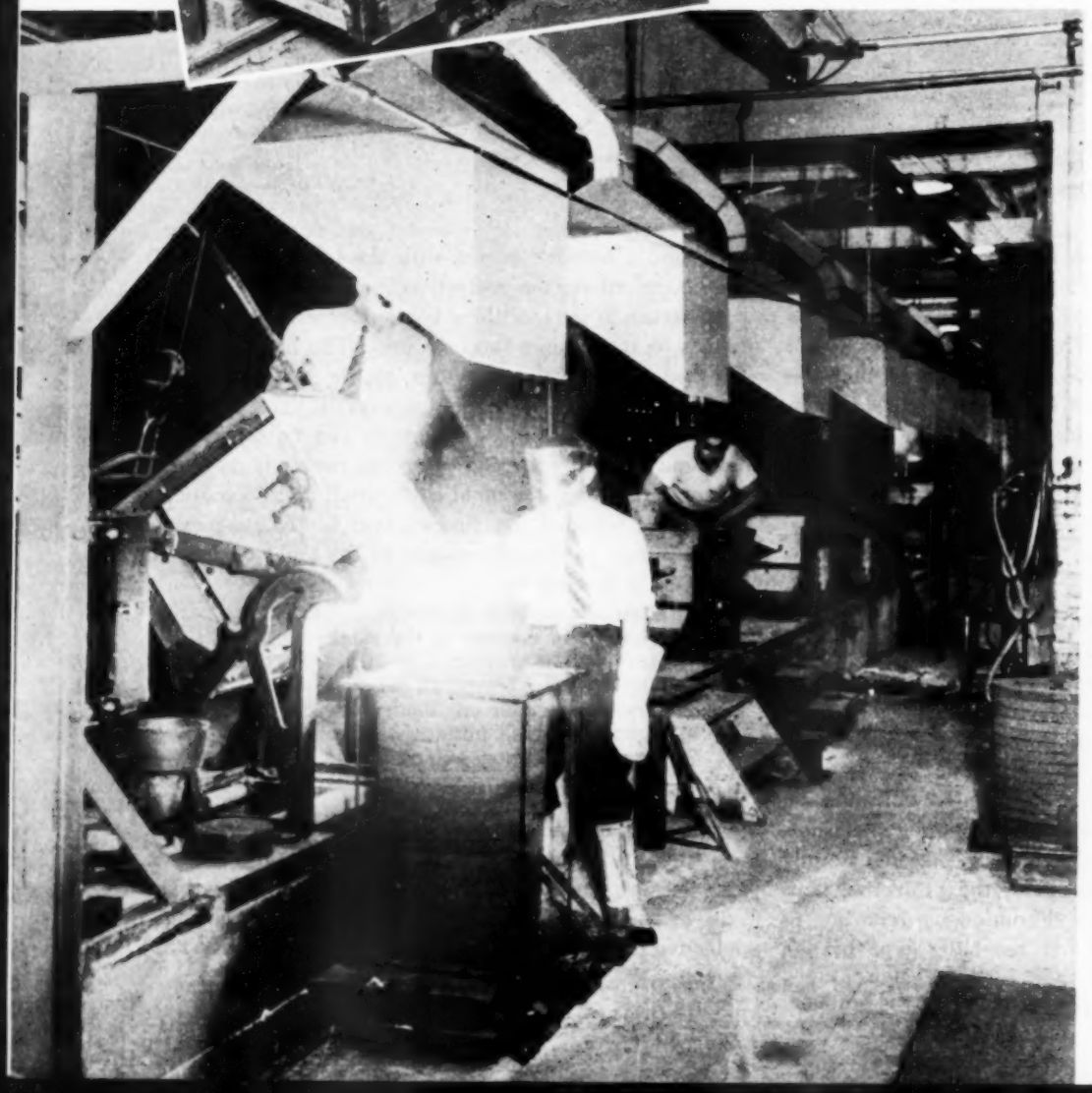
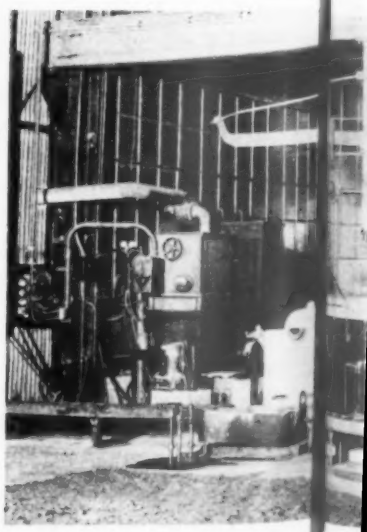


Fig. 1 (left above) — Typical installation of lift coil furnaces using No. 70 crucible and melting 190-pound charge of bronze in 16 to 18 minutes

Fig. 2 (left)—Line of six furnaces, any one of which can be powered by either of two motor-generator sets

Fig. 3 (below)—Foundry installation at Taylor Wharton Iron & Steel Co., with one furnace arranged to handle 650-pound charges



Melting

By GEORGE F. APPLEGATE
Engineer
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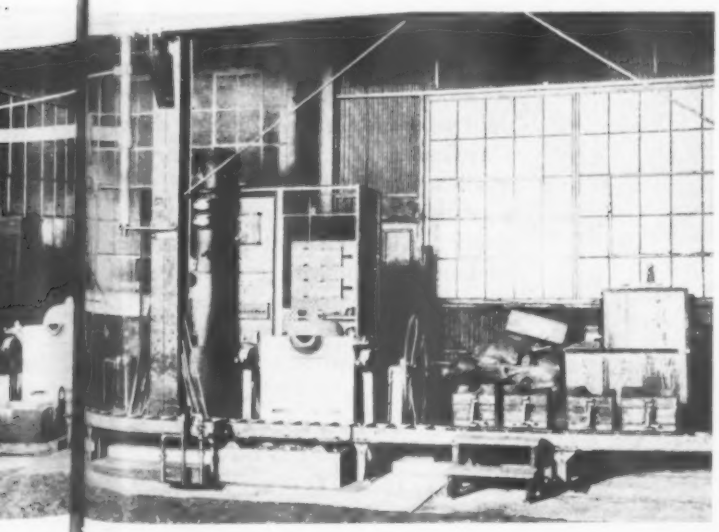
Trenton, N. J.

principles of good foundry planning for optimum use of the advantages of high frequency melting.

Most important principle is to select the combination of furnaces, both as to size, lining, and method of pour, by which all melting can be handled most effectively. Aside from the metallurgical and electrical aspects, which are not within the scope of this article, the choice depends upon the ranges of sizes of melts desired (perhaps including laboratory melts), frequency of change of alloy, and the desired production schedule.

Largest item in the cost of a complete high frequency furnace installation is the power source with all the controls, capacitors, and other equipment required. Two types of high frequency power sources are available for induction melting, namely, motor-generator sets, and spark-gap converters. Motor-generator sets are used for most production melting with power capacities of 50 to 1500 kilowatts. Spark-gap converters are recommended for laboratories and small production melts which require capacities from 3 to 40 kilowatts and frequencies of from 20,000 to 60,000 cycles. Frequencies above 60,000 cycles are not too practical and are used rarely for melting.

Furnaces are divided into two main types: Nose tilting and lift coil. In the nose tilting type, the shell, coil and crucible form an integral, box-shaped unit pivoted on an axis through the pouring spout so that it can be poured by tilting the furnace. Crucibles and linings in these furnaces can easily be changed when necessary. The lift-coil furnace consists only of the boxed coil unit, which is lowered around a standard crucible by a hoist. When the melt is finished, the coil is lifted and the crucible



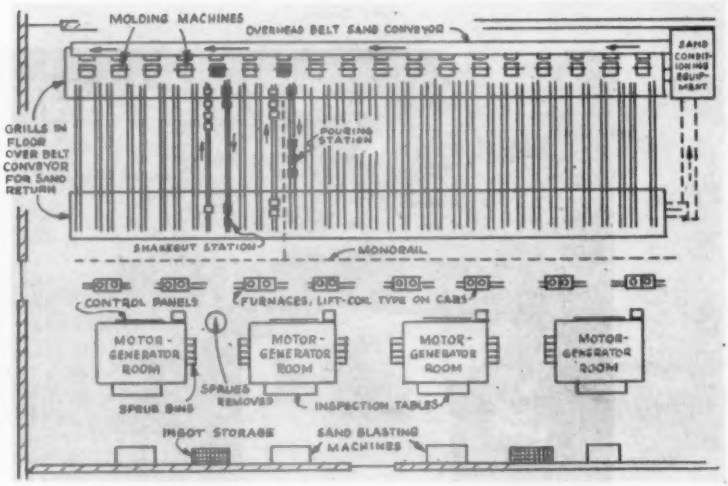


Fig. 4—Schematic diagram of bronze foundry of American Hammered Piston Ring Division, Koppers Co., Baltimore

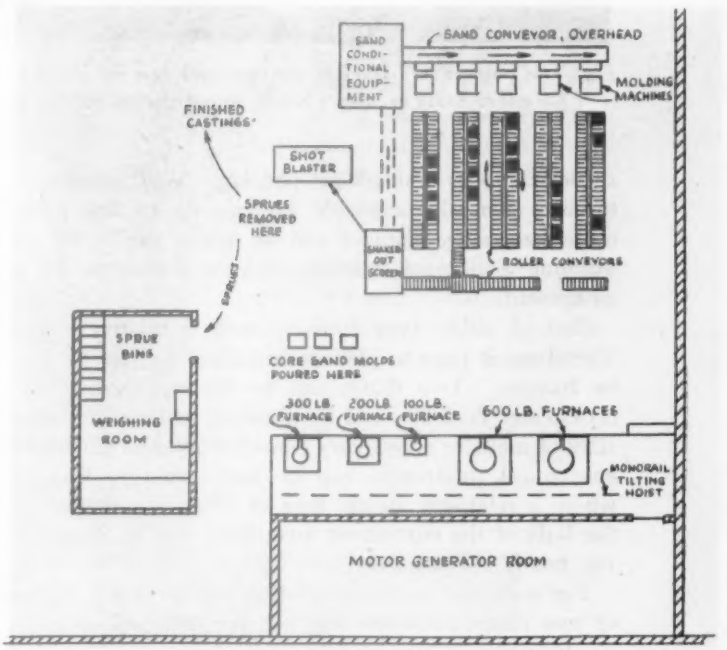


Fig. 5—Foundry layout at the Indiana Steel Products Co., Valparaiso, Ind., includes five furnaces ranging from 100 to 600-pound capacity

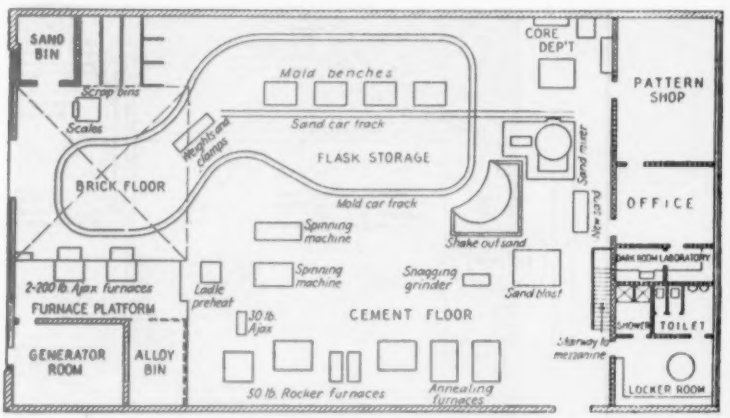


Fig. 6—Floor plan of Gorham Tool Co., Detroit. Sand is carried to molders by rail car, and molds are carried over tracks to pouring station and finally to shakeout

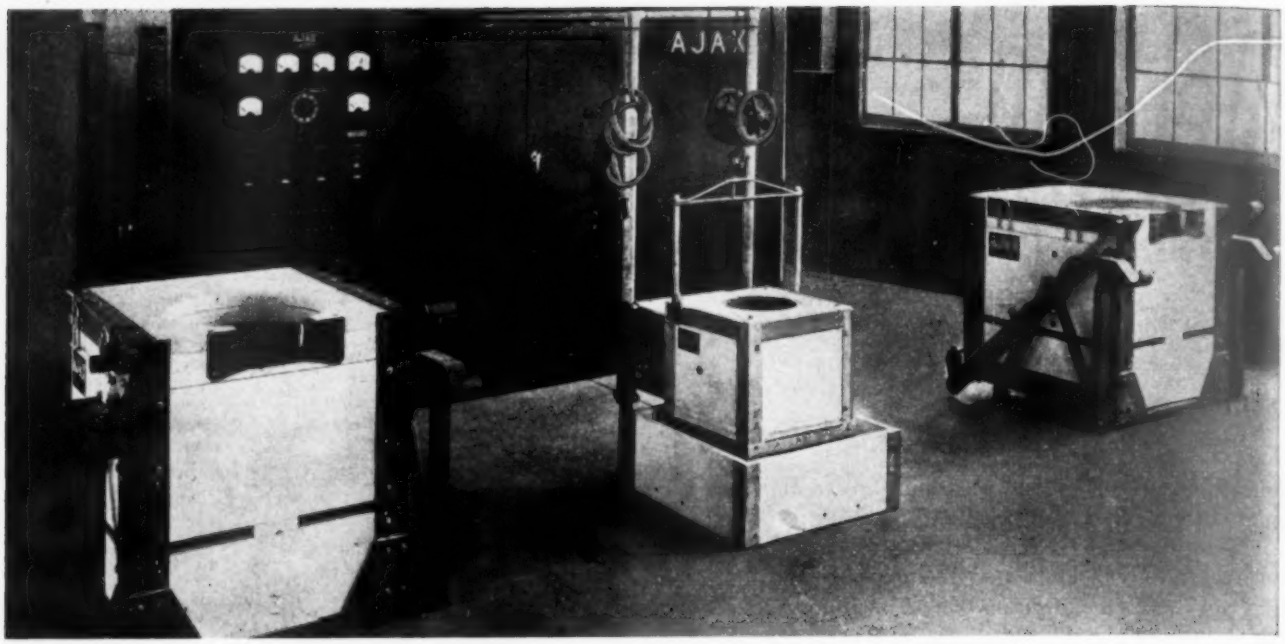


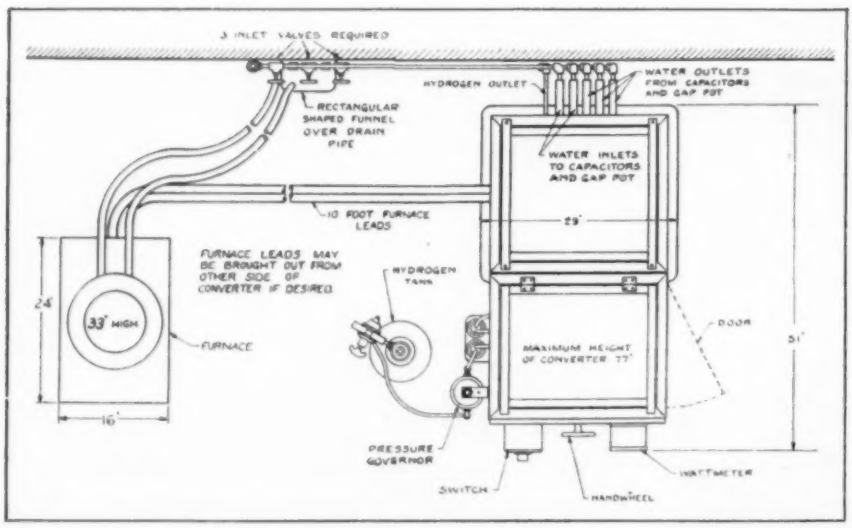
Fig. 7—Compact 175-kilowatt furnace unit can be located anywhere in the foundry. The 650-pound furnaces can be lined for either brass or steel. Small, miscellaneous melts are made most conveniently in the lift-coil furnace in the center

is picked up in a shank for pouring. With this type of furnace, generally available in sizes up to 300 pounds of bronze, alloy changes can be made simply by substituting a different crucible, with no *down-time* for the equipment.

Cost of either type furnace itself is relatively small. Therefore, it pays to plan on installing a spare or standby furnace. Two things can be accomplished by this: (1) Greater flexibility can be obtained in foundries where sizes of melts or alloys vary considerably, and (2) smooth, economical production can be maintained in foundries where a relatively steady flow of alloys is required and the bulk of the equipment investment can be kept working nearly all the time.

For instance, in the installation shown in Fig. 2, each of two motor-generator sets can be switched to any of six furnaces in the line in any sequence. Any large casting up to the combined capacity of the four biggest furnaces can be handled by melting charges in two furnaces, then melting charges in two other furnaces, and finally switching back to the first two furnaces for a few seconds to bring them back up to proper temperature just before pouring. By including both large and small furnaces in the line, there is a unit that is just right for efficient melting on many size jobs. Each furnace operates with high efficiency even when only half full of metal.

When production is continuous, it is often advantageous to install a line of medium-size furnaces making more frequent heats, rather than to install one or two big furnaces making only a few heats a day, unless larger heats are required for large castings. Where temperature control is important, the temperature between the first pour and the last pour of the large heat may be held constant by maintaining reduced power during the pouring period. However, a large pouring floor area is needed to store completed molds for a large heat, whereas with continuous frequent small heats, the molding machine operators need only be a few molds ahead of the furnaces.



The high frequency furnace itself is compact and can be located right at the point of application. In smaller units, the power source is self-contained and takes little floor space right near the furnace. Fig. 8 shows a typical layout for a laboratory or small scale production furnace with a spark gap converter as its power source. A 175-kilowatt unit with self-contained, two-bearing motor-generator set and controls is shown in Fig. 7. The two-bearing, motor-generator operated (*Please turn to page* 202)

Fig. 8—Plan view of 20-kilowatt converter and furnace

Patterns for Magnesium Castings

By HARRY J. JACOBSON
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Chicago

ONE OF THE basic factors in successful production of quality magnesium castings is the pattern. This is partly due to the fact that today magnesium castings are used primarily for aircraft work and all walls are held comparatively light, thereby permitting little dimensional variations in cores, etc. When a blueprint calls for plus or minus 1/32-inch, it would not be safe to assume that a wall of 5/32-inch would pass inspection if it were reduced to ⅛-inch due to core shift or other cause.

In designing a pattern for this type of casting all walls should be held 0.010 to 0.015-inch heavier on a side to allow the foundry some benefit of the tolerance shown on the blueprint. Inspection will pass a slightly heavy wall, but one is treading on thin ice if the bare minimum is held. All bosses should be held 1/64-inch full on radius, and all machined flanges should have a safety factor of 1/32-inch on the back side.

This means that the plus or minus on the blueprint refers to the finished casting and not the pattern. Within what tolerance should the metal pattern be made to assure the foundry the full benefit of the specified tolerances? Let us say within 0.005-inch for liberal allowance on castings up to 20 to 24 inches, and possibly 0.010 to 0.015-inch on proportionately larger ones. To produce a metal pattern and core boxes of such tolerances the master patterns must be made with finish allowance all over, and the metal pattern and core boxes laid out and machined to include safety factors on wall thickness, bosses and flanges, as mentioned previously. To attempt to cast a pattern of this nature to size and clean up all surfaces or parts is only inviting trouble.

As an illustration of what can be done from the standpoint of making sand castings to close tolerances, Fig. 1 shows a pattern for a landing wheel. This equipment is machined completely on all surfaces, vent pins and rings installed, rubbing fixtures and flush pin coresetting gages furnished complete; also three annealed and machined sample dryers. The assembly con- (*Please turn to page* 192)

Fig. 1 (*below*)—*Parts of pattern for cast magnesium landing wheel. The casting itself is shown at the bottom, left center*

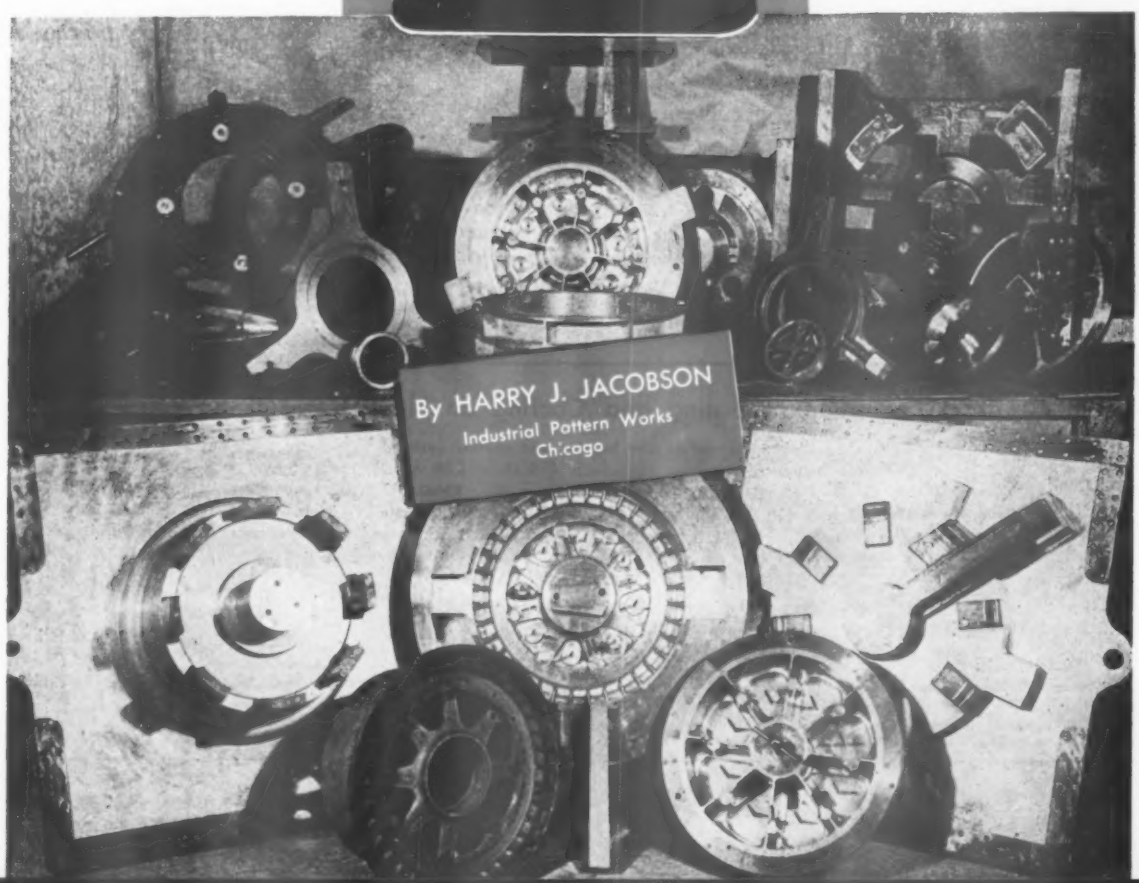
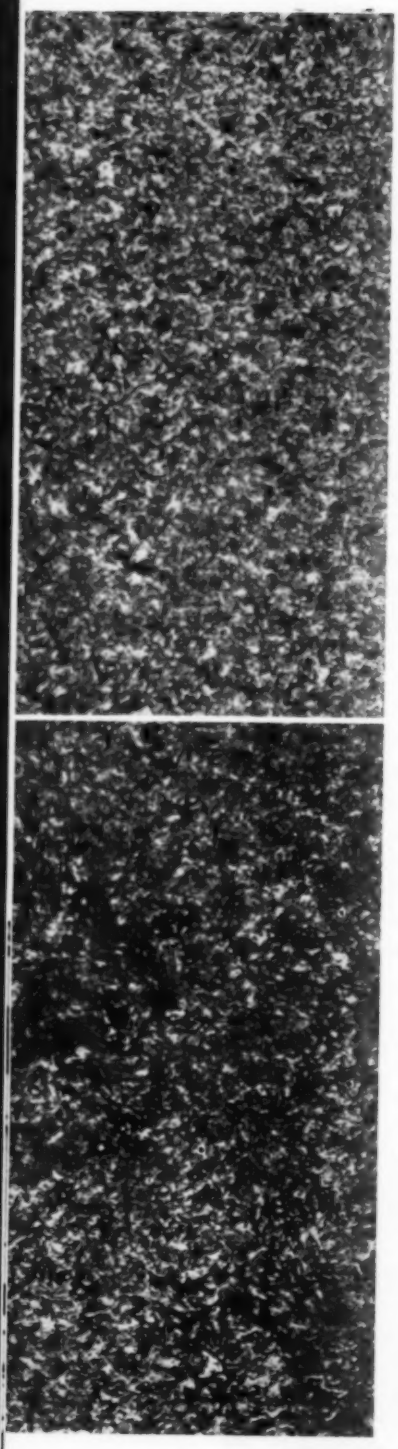


Fig. 2 (*left*) — *Positioning main body core by four side flush pins. Top flush pins show exact up-and-down position of core*



Vanadium ... in Gray Iron

EFFECT of vanadium as an alloying addition to steel long has been established as an important factor in ferrous metallurgy. Steel foundries as well as producers of wrought steels, have relied upon the beneficial influence of this element on the physical and mechanical properties of steel for many years. However, its development as an alloying element in gray cast iron has been much slower for a number of reasons. In the first place, our knowledge of the effect of vanadium in steel cannot be used directly in cast iron metallurgy. For example, the graphite structures of cast iron are frequently of greater importance than the matrix in which they are contained. Therefore, our first consideration may not be the effect of vanadium on the matrix, but the effect on the graphite structure.

A factor which has accelerated the development of this element in cast iron metallurgy recently is the fact that vanadium has been found to be of greatest importance in combination with other alloying elements. This has complicated the study, since the number of such combinations to be investigated is almost limitless. However, progress has been slow primarily because laboratory methods of determining properties, such as wear resistance, heat resistance and heat shock resistance, have been, and remain inadequate; these approach performance tests in character and are far more difficult to devise, control and interpret. Since one of the greatest benefits of vanadium is the control of these properties, it has been necessary to rely very largely on service data. Although such data are more reliable, they are more difficult to obtain.

Despite the difficulties mentioned, rapid progress was made in vanadium cast irons in the period immediately prior to the present world conflict. This development has been in suspense during the last two years for obvious reasons, but now is being revived. The authors present this resume of the more recent developments in this particular field, in the hope that this information will facilitate the most advantageous use of vanadium by the iron foundry industry, and possibly suggest methods whereby mechanical and physical properties may be obtained with greater certainty than is now possible.

In spite of the fact that this development in gray cast iron is recent, the available data are already too extensive to permit of complete coverage in a single article of this type. The presentation of these data is further complicated by the fact that the combinations of vanadium with other alloying elements are so numerous. Therefore,

Fig. 1—Macrostructure of a vanadium alloy cast iron at top, and at bottom macrostructure of similar alloy cast iron without vanadium. Both macrographs 9 diameters, nital etch

Table I—Effect of Repeated Heating and Cooling on Plain and Alloyed Gray Irons

(At end of 150 heating and cooling cycles)

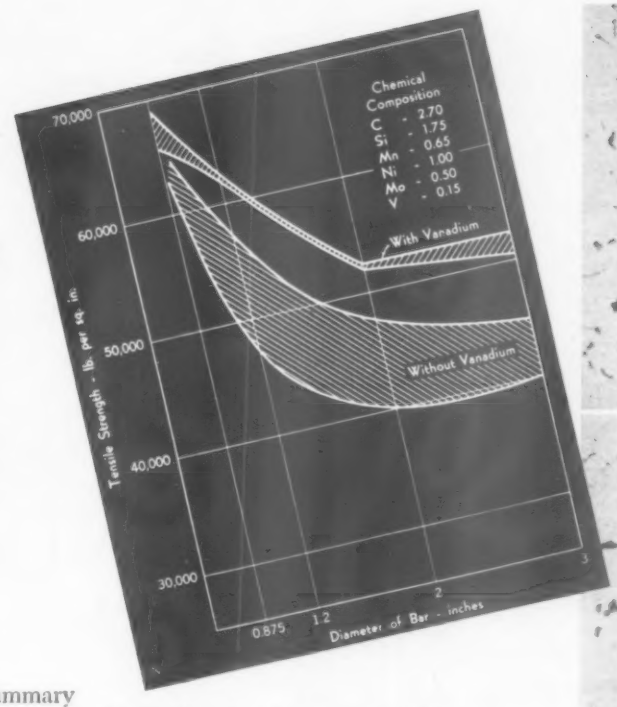
Chemical composition (alloys excluded): C-3.15 Si-1.80 S-0.12 P-0.14 Mn-0.60

Alloying Elements				Original Tensile Strength 1000 lb. per sq. in.	Final Tensile Strength 1000 lb. per sq. in.*	Increase In Weight per cent	Warpage Inches Rise in 12 in.	Increase In Length per cent
Cu	Ti	Zr	V					
...	...	...	...	37.5	11.9 to 21.4	3.20	0.23	5.37
...	...	...	0.10	41.5	16.2 to 31.1	3.80	0.24	4.35
...	...	0.20†	...	32.5	9.3 to 18.6	3.76	0.28	6.12
...	...	0.20†	0.10	34.0	16.4 to 25.5	3.13	0.235	4.85
1.50	...	...	0.10	40.5	27.4 to 34.7	3.12	0.15	4.55
...	0.20‡	...	0.10	37.5	12.0 to 30.5	3.85	0.25	4.92
Commercial "heat resisting" Plain Iron				Unknown	4.7 to 5.7	4.32	0.21	7.58

* Varies with position in test block. † Added; none recovered. ‡ Added; 0.05 recovered.

By R. G. McELWEE
Vanadium Corp. of America, Detroit
and
T. E. BARLOW
Battelle Memorial Institute, Columbus, O.

on Castings



it seems advisable to deal with the general trends as broadly as possible; quoting specific examples except in those cases in which the information must be withheld because of wartime restrictions.

An understanding of the influence of vanadium upon the microstructure and macrostructure of gray cast iron is desirable in order to comprehend its effect upon the physical and mechanical properties of iron castings. The following summary indicates some of the basic reasons for the behavior of vanadium-bearing gray cast irons.

Most carbide-stabilizing elements retard the rate of graphitization, and limit the amount of graphite formed. However, these elements differ from each other in the manner in which they behave, and also in the properties of the particular carbide resulting from their use. Vanadium is the most potent of the carbide stabilizing alloying elements customarily used in cast iron. The carbide which is formed is unique in its stability at elevated temperatures, and is unusually tough and resistant to thermal shock. The toughness and stability of the carbide formed when vanadium is added, in even small quantities, is largely responsible for the more important applications such as wear resistant castings which, under service conditions, are subjected to high stress and/or elevated temperatures.

Recent researches on pearlitic cast irons indicate that vanadium promotes small uniform graphite flakes, and reduces segregation and the tendency toward formation of the so-called whorl or rosette pattern. This effect is illustrated in Figs. 1 and 2.

The influence of the vanadium in decreasing the graphite flake size is particularly noticeable under conditions of slow cooling such as encountered in a heavy casting, but the reduction in graphite flake size is not nearly as noticeable in the light sections in which the graphite flakes are normally very fine without alloy additions. Therefore, the net result of an addition is to increase the uniformity of graphite flake size from center to surface of a given section, and from a heavy to a light section of the same casting. This factor is of importance in the production of heavy sectioned castings such as automotive body dies. The control of graphite size and elimination of ferrite areas (as a result of increased carbide stability) are prime considerations in gray iron castings subjected to stress, wear and abrasion.

As in steel, vanadium in iron promotes extremely fine carbides. If the cooling rate is such that the vanadium-bearing iron is pearlitic, the pearlite formed tends to be much finer than without the addition. The resulting structure is then more homogenous. In irons already fully pearlitic without vanadium, the effect of the addition is to produce sorbite (extremely fine pearlite). This structure is of particular value in applications in which stress and wear must be resisted to the greatest degree.

Vanadium restrains and retards complete solution and decomposition of the carbides into which it enters and thus improves the stability or resistance to structure change of iron at elevated temperatures.

Reduction of mechanical properties usually observed in unalloyed irons at elevated temperatures (*Please turn to page* 246)

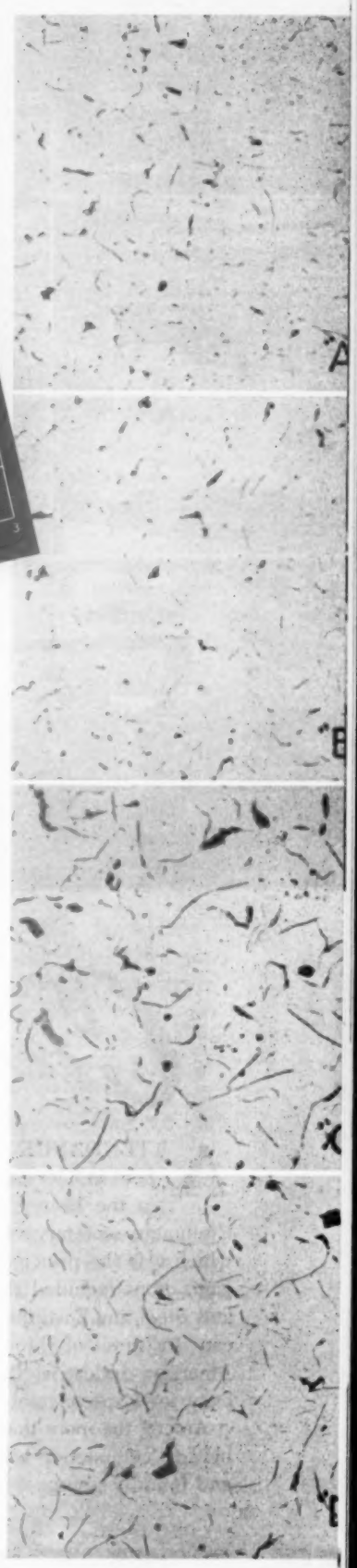
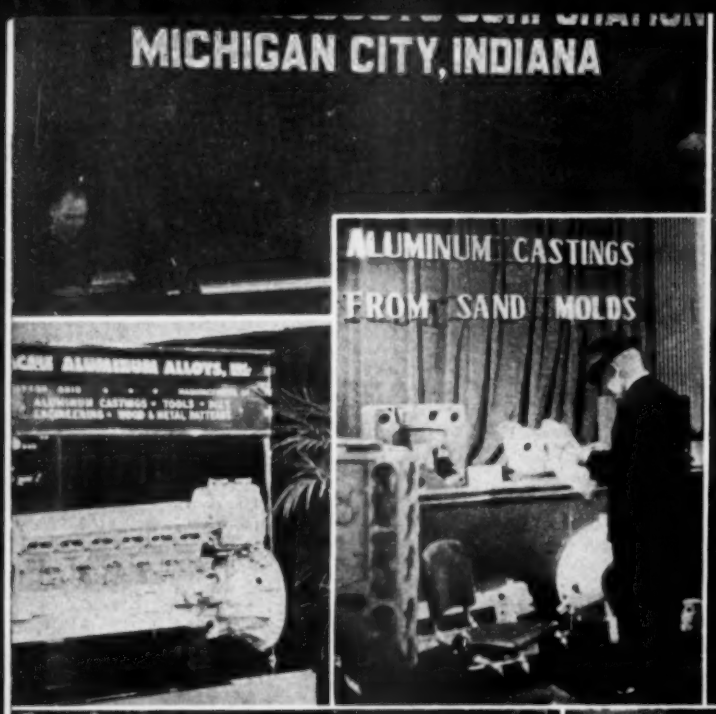
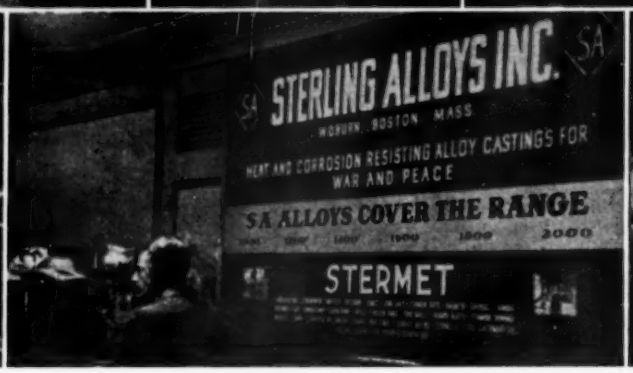


Fig. 2 (Right)—Two top panels show microstructure of a copper-vanadium cast iron at center of ½-inch section (A), and at edge of ½-inch section (B). Lower panels show microstructure of similar cast iron without vanadium at center of ½-inch section (C), and at edge of ½-inch section (D). Micrographs 100 diameters, unetched. Fig. 3 (Above)—Effect of vanadium on tensile strength of an alloy cast iron

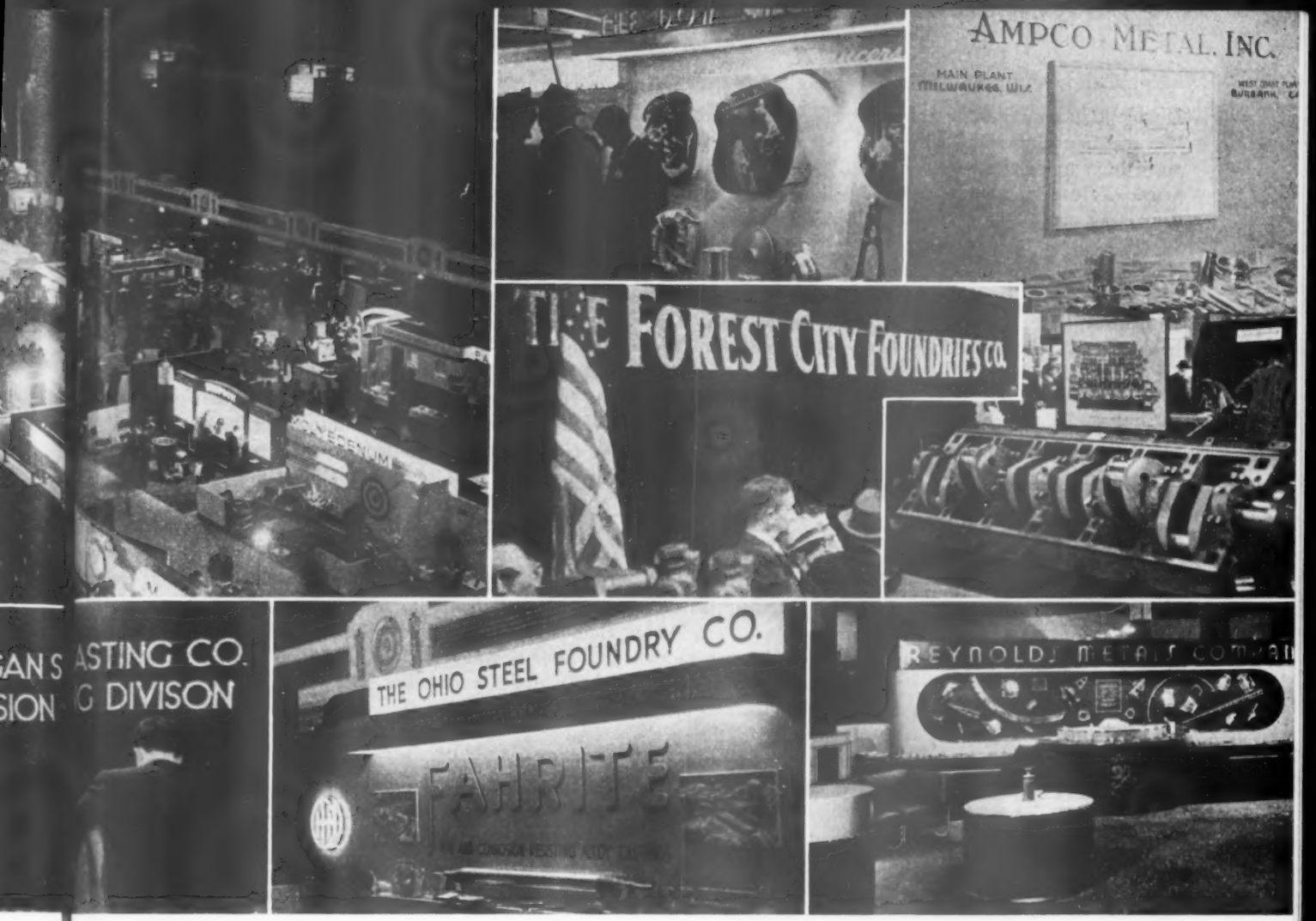




Castings at the Metal

ATTENDANCE at the National Metal Congress held in Cleveland on Oct. 16 to 20 was the largest in the history of the event, according to W. H. Eisenman, secretary of the American Society for Metals, which was the principal sponsor. Other participating organizations included the American Welding Society, Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers, American Industrial Radium and X-ray Society, and Society for Experimental Stress Analysis.

Among the more than 400 exhibitors at the Metal Show held in conjunction with the Congress were 26 foundries and foundry groups which displayed steel, gray iron, malleable and nonferrous castings. Those participating included the following: Acme Aluminum Alloys Inc., Dayton, O.; Alloy Casting Co., Champaign, Ill.; Aluminum Co. of America, Pittsburgh; Aluminum Industries Inc., Cincinnati; American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill.; Ampco Metal Inc., Milwaukee; Bergen Precision Castings Co., Pleasantville, N. Y.; Briggs Mfg. Co., Cleveland; Chicago Steel Foundry Co., Chicago; Dow Chemical Co., Midland, Mich.; Electro-Alloys Co. Division, American Brake Shoe Co., Elyria, O.; Forest City Foundries Co., Cleveland; Frontier Bronze Corp., Niagara Falls, N. Y.; Fulton Foundry & Machine Co., Cleveland; General Alloys Co.,



...l Show

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

Boston; Malleable Founders' Society, Cleveland; Meehanite Research Corp., New Rochelle, N. Y.; Michiana Products Corp., Michigan City, Ind.; Michigan Steel Castings Co., Detroit; National Bronze & Aluminum Foundry Co., Cleveland; Ohio Steel Foundry Co., Lima, O.; Reynolds Metals Co., Louisville, Ky.; Standard Alloy Co., Cleveland; Sterling Alloys Inc., Woburn, Mass.; Wayne Foundry Co., Detroit and J. R. Wood Products Corp., New York.

At various sessions of the American Society for Metals a number of papers were presented relating to castings. One was "The Properties of Aluminum Alloys Melted in an Induction Heated Crucible Furnace", by James W. Poynter, Wright Field, Dayton, O., which described use of a small high frequency furnace for melting three types of aluminum alloys, as follows: Containing 4.5 to 5.0 per cent copper, 1.5 maximum silicon and 1.0 maximum iron; 4.5 to 5.5 per cent silicon, 1.0 to 1.5 per cent copper and 0.4 to 0.6 per cent magnesium; and 6.5 to 7.5 per cent silicon, 0.2 to 0.4 per cent magnesium, and 0.6 per cent iron.

Test bars were poured from a number of heats, and the physical properties determined. Radiographic and microscopic examinations of the bar structures were made. The author concluded that compositions of the alloys and physical properties substantially were unchanged by repeated remelting and castings, and that the properties were in excess of the minimum values specified in Army-Navy Air Corps specifications. Use of chlorine gas or other fluxing methods were not required with induction melting.

James Rigbey, Ford Motor Co. of Canada, Windsor, Ont., presented a paper on "Improved Sensitivity in

Double Exposure Radiography" which discussed use of two separate films with a marker, and a shifting of the x-ray tube to determine the vertical position of a flaw. Sensitivity over the single film method is improved from 4 to 1 per cent while errors in results remain better than 10 per cent of the specimen thickness. Maximum possible error in actual measurements is about 14 per cent.

Interpretation of radiographs of aircraft parts was described by Leslie W. Ball, Triplett & Barton Inc., Burbank, Calif., who outlined the basic policy and procedure for such work. He said that it has been found convenient to divide defects into 6 groups, including sharp discontinuity, shrinkage, holes, dispersed defects, heterogeneities, welding, and miscellaneous. Each of those are divided further into subgroups, and to familiarize the radiographer with appearances of each, an extended series of radiographs were prepared for reference.

Cast steels containing 5 to 9 per cent chromium and 0.5 to 1 per cent molybdenum and used for corrosion and elevated temperature service are noted for their thermal sluggishness which makes them susceptible to cracking during heat treatment and welding. A study of a series of steels within that range by N. A. Ziegler and W. L. Meinhart, Crane Co., Chicago, shows that thermal sluggishness and hardenability vary according to the percentage of carbon, chromium and molybdenum, and are not increased appreciably at the top range of chromium and molybdenum if the carbon is held under 0.07 per cent. Air hardening tendency is strong when carbon exceeds 0.20 per cent. Increasing carbon has a more pronounced effect than chromium and molybdenum in raising strength and hardness and reducing ductility. More than 1 per cent molybdenum or a combination of 7 to 9 per cent chromium plus 0.25 per cent molybdenum or higher tend to close the gamma loop in the constitutional diagram which results in decreased thermal sluggishness, strength and hardness.

F. B. Rote, Wyman Gordon Co., Worcester, Mass., and W. P. Wood, University of Michigan, Ann Arbor, Mich., investigating the effect of molybdenum in phosphorus-bearing alloy cast iron, found that phosphorus in the particular iron was soluble to the extent of about 0.12 per cent, and that additional phosphorus above that amount formed a complex eutectic which, with molybdenum present, contains 1.3 units of molybdenum for each unit of phosphorus.

Consequently, the characteristic high strength acicular structure is changed to pearlitic structure as the phosphorus is increased sufficiently above the solubility limit. Attempts to control the structure of high phosphorus irons by compensatory molybdenum additions are only partially successful, due to a pearlitic envelope surrounding the phosphide eutectic. Segregation of molybdenum occurs on cooling from iron-iron carbide eutectic to iron-iron phosphide eutectic. Reversal of the reaction does not take place on reheating to the iron-iron carbide eutectic temperature.

Meeting of particular interest to the foundry field was that held Friday afternoon in the ballroom of Public Hall on "Improved Gray Iron Castings". It was a panel-type meeting with several experts discussing various phases of the subject and answering questions from the floor, and was followed by a summarization of the pertinent points brought out. Frank G. Steinebach, editor, THE FOUNDRY, was chairman of the session and the experts were V. A. Crosby, Climax Molybdenum Co., Detroit; R. G. McElwee, Vanadium Corp. of America, Detroit; John Erler, Farrel-Birmingham Co. Inc., Ansonia, Conn., and W. A. Hambley, Allis-Chalmers Mfg. Co., Milwaukee. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., was the summarizer.

Foundrymen Favor Hot Iron

Mr. Crosby's topic was hot iron and its advantages, blast control and other expedients. He pointed out that there is no sharp demarcation between hot and cold iron since what may be considered hot iron in one foundry may be termed cold in another. He stated that in general all foundrymen like to melt and superheat the iron to the temperature designated as hot for the particular foundry practice, and if necessary cool it down to the desired pouring temperature. However, nothing useful can be done with cold iron from the cupola.

According to Mr. Crosby, some of the advantages of low side pouring temperatures (under 2600 degrees Fahr.) are less shrinkage in heavy sections, improved casting surface, and in chilled castings less tendency for iron to fuse to the chill, a somewhat deeper chill, and greater chill life. Advantages of high side pouring temperatures include fewer defective castings from blowholes, cold shuts and mis-runs; less difficulty with chilled edges and corners; cleaner ladles and better operating conditions; more uniformity in physical properties.

Confining further remarks to the cupola, Mr. Crosby pointed out that it is one of the most efficient, continuous melting furnace developed, and (*Please turn to page* 198)

Retaining Physical Properties with Composition Change

By THOMAS D. WEST

West Steel Casting Co.
Cleveland

DURING the period immediately prior to this country's entry into the war little thought was given to the possibility of a scarcity of molybdenum as an alloying agent in steel castings. At that time various combinations of nickel, chromium, manganese and molybdenum were used to produce steel castings to meet federal specification QQS-681b classes 4C2, 4C3 and similar work. Shortly after the outbreak of the war supplies of chromium and nickel were curtailed sharply and alloy users switched heavily to the use of molybdenum.

So heavy was the drain on the stockpile of molybdenum that it became in the critical class, and the government had to release some chromium and nickel it had tried to stock in order to conserve molybdenum. Faced with the necessity of conserving molybdenum as well as other critical alloys, various organizations including WPB requested reduction of molybdenum constant in steel castings especially those in class 4C2 and 4C3. One suggestion was to substitute a low alloy steel containing 0.28 to 0.32 per cent carbon, 0.60 to 0.80 per cent manganese, 0.10 to 0.15 per cent molybdenum, 0.30 to 0.40 per cent nickel and 0.30 to 0.40 per cent chromium for the commonly used alloy containing 0.28 to 0.32 per cent carbon, 1.40 to 1.60 per cent manganese, 0.30 to 0.40 per cent molybdenum, and residual chromium and nickel.

In considering a change in alloying elements, there are three important factors which must be considered when the same physical properties are to be met. Listed in the order of their importance, they are: 1. Selection of alloys. 2. Correct deoxidants and deoxidation practice. 3. Heat treatment.

1. Selection of Alloys. It is not desirable to have the alloying effect on steel castings result in air hardening. Any type of cast steel which is air hardening has to be handled very carefully in the cleaning room especially during the burning, welding and grinding processes so as not to produce the type of cracks in the casting which are only too well known to every steel foundryman.

The carbon should be kept around 0.28 to 0.32 per cent range as this is a very workable steel foundry range especially when castings are to be quenched.

The alloy should give toughness and strength to the casting after the quench and draw, not brittleness.

The alloys should be kept as low as possible with the conservation program of critical metals in mind.

The cost of alloys is of minor importance as the usage of alloys are government controlled in regard to quantity and price.

The alloys (*Please turn to page* 228)

Table I—Results of Nine Heats of Varying Composition

	Deoxidizers Pounds/Ton	Chemical Analysis C	Mn	Si	S	P	Mo	Cr	Ni	B	Heat Treatment: Normalize Hrs @ Tmp	Quench Hrs @ Tmp	Draw Hrs @ Tmp	Physical Results: Tensile lb. sq. in.	Yield lb. sq. in.	Elong %	R.A. %	BHN
1	5# Ca Mn Si 2½# Al	0.28	1.35	0.58	0.041	0.050	0.26	...	...	...	1700° 3½ hrs.	1600°-WQ 2 hrs.	1100° 3 hrs.	122,000	106,500	17.0	37.1	255
2	4# Ca Mn Si 3# Fe Ti	0.36	1.38	0.51	0.046	0.050	0.20	0.02	...	...	1700° 3½ hrs.	1600°-WQ 2 hrs.	1100° 3 hrs.	120,000	100,000	17	39.4	248
3	5# Ca Mn Si 2½# Al	0.31	1.32	0.56	0.040	0.049	0.14	0.17	...	...	1700° 3½ hrs.	1600°-WQ 2 hrs.	1100° 3 hrs.	131,250	114,250	16	35.0	285
4	5# Ca Mn Si 2½# Al	0.29	1.27	0.56	0.042	0.050	0.12	0.15	...	...	1700° 3½ hrs.	1600°-WQ 2 hrs.	1100° 3 hrs.	122,000	105,500	16	37.4	269
5	5# Ca Mn Si 2½# Al	0.30	1.32	0.34	0.040	0.046	0.09	0.06	...	...	1700° 3½ hrs.	1600°-WQ 2 hrs.	1300°-3 hrs. 1100°-3 hrs.	95,750 113,000	73,250 85,500	23.0 17	56.0 37.3	197 248
6	2# Borosil 2½# Al 5# Ca Mn Si	0.29	1.44	0.46	0.036	0.046	0.10	0.02	...	.005	1700° 3½ hrs.	1600°-WQ 2 hrs.	1000° 3 hrs.	127,000	107,500	16	35.8	269
7	5# Ca Mn Si 2½# Al	0.37	1.62	0.50	0.040	0.045	0.09	0.29	0.32	...	1700° 3½ hrs.	.....	1100° 3 hrs.	119,000	83,000	18	35.0	296
8	5# Ca Mn Si 2½# Al	0.32	1.68	0.53	0.030	0.050	0.08	0.32	0.34	...	1700° 3½ hrs.	1600°-WQ 2 hrs.	1100° 3 hrs.	130,000	116,000	15	36	296
9	5# Ca Mn Si 5# Fe Ti 3# Borosil	0.36	1.45	0.59	0.043	0.049	0.09	(Res) .11	...	.0006	1700° 3½ hrs.	1600°-WQ 2 hrs.	1100° 3 hrs.	121,000	100,000	18	42.5	255

QUESTIONS and ANSWERS

Making Pressure Matchplates

Q.—Can you tell us where we can obtain information on the method and equipment used in making pressure matchplates?

A.—Production of matchplates by the pressure molding process involves the use of plaster of paris or gypsum cement as the mold material, and if you are not familiar with the details of that molding method, it is advisable to study carefully the information presented in the March, 1944 issue on "Casting in Plaster Molds", by Fred Chambers. Then proceed to experiment by making molds and castings until you have mastered the fine points, and can produce quality castings.

Briefly, the pattern coated with an oil-wax parting compound is placed in a snapflask of the desired size and the liquid plaster poured over it. The whole is allowed to stand for 15 to 30 minutes until the plaster air-sets and becomes firm. Then the pattern is removed, the flask taken away, and the mold is placed in an oven to dry. Temperature may range from 600 to 1300 degrees Fahr. Time for drying will depend on the temperature, requiring 8 to 10 hours at 600 degrees and only 2½ hours at 1300 degrees. Molds are allowed to cool to 300 degrees before removal from the oven.

In pressure casting the pouring sprue is extended 18 to 24 inches above the mold by a sleeve made of plaster, a metal pipe lined with plaster, of core sand or other refractory material. Generally the end of the sleeve is closed off at the bottom with a thin asbestos disk so that it may be filled with molten metal and then punctured. In some shops the upper end of the sleeve is arranged so that a cap may be fitted on so that air pressure of 80 to 100 pounds per square inch may be applied to the molten metal. In that case the additional pressure from application of the air breaks the disk.

Pulley Size Must Be Adequate

Q.—For emergency purposes only we are installing a secondhand fan blower for our cupola which is lined to 54 inches at the melting zone. Motor is 50 horsepower and speed is 1750 revolutions per minute. Blower is No. 12 made by the Buffalo Forge Co., and has 5 steel blades, 18-inch outlet and cast iron shell. We understand we need 7000 cubic feet of air per minute to melt 11 tons per hour, and would like to know sizes of the pulleys on both fan and motor to obtain that rate of flow.

A.—Your figure of 7000 cubic feet of air per minute is somewhat higher than that usually employed. In general it is based on 30,000 cubic feet per ton of iron, and in your case the figure would be slightly over 6000 cubic feet per minute. Perhaps you were including an excess to account for leaks between blower and cupola and for slippage in the fan itself. However, we believe with a little attention to the construction of the windpipe an allowance of 10 per cent will take care of those items, and hence the blower will need to supply 6600 cubic feet of air per minute.

Data from the blower manufacturer's catalog indicates that the blower mentioned supplies about 5.61 cubic feet per revolution, and to supply 6600 cubic feet, the blades should rotate at 1180 revolutions per minute. Since the motor speed is fixed at 1750 revolutions per minute, its pulley will have to be smaller than that on the blower to affect the necessary reduction in speed. You do not mention whether the blower has a pulley on it at present, but the manufacturer indicates that it is equipped with a 10-inch diameter, 8-inch face pulley. If that is the case, the motor pulley should be 6¾ inches in diameter. However, we believe that better transmission of power and longer belt life will be obtained by using larger pulleys on both. Therefore, it is suggested that you use a 12-inch pulley on the blower with an 8-inch pulley on the motor, or better use a 14-inch pulley on the blower, and a 9½-inch pulley on the motor.

Chilled Car Wheel Composition

Q.—Can you tell us what is the chemical composition of standard chilled cast iron freight car wheels?

A.—While the composition of chill-cast car wheels from different sources may vary to some degree, we believe that the average analysis will show around 0.55 per cent silicon, 0.14 per cent sulphur maximum, 0.30 per cent phosphorus, 0.60 per cent manganese, and 3.35 per cent minimum total carbon. In recent years many of the car wheel producers have been using tellurium to enhance the chilling properties or tendency, but since the life expectancy of wheels in service is from 5 to 7 years, it will be some little time yet before scrap wheels containing tellurium will appear.

Head Size for Steel Castings

Q.—We often have heard that in heading steel castings that the height of the head should be 1½ times the diameter. We would like to know why as well as what would happen if the ratio were greater or smaller. Again we find that a certain system of heading produces thousands of good castings, and then for no apparent reason an epidemic of shrinks occurs. What factors might be involved in that change? Patterns are mounted on a board with attached heading system.

A.—The old steel foundry rule that the height of a sink head should be 1½ times the diameter is based to the best of our knowledge, on observation of the fact that with such proportion of height to diameter, the shrinkage cavity in the head will seldom, if ever, extend into the casting. We know of no calculation to show that this is the ideal proportion. It is based, of course, on the premise that the heads are cylindrical instead of rectangular. Heads of the latter cross section do not feed as efficiently as cylindrical ones because of the rapid solidification of the metal in the corners.

When the height of the head is less than 1½ times the diameter, the shrinkage cavity often will extend to the bottom of the head into the casting. If the height is more than 1½ times the diameter, there is usually a considerable amount of perfectly solid metal at the bottom of the head which represents a plain waste of metal with decrease in percentage of yield. If the metal in the sink head freezes completely across the top soon after it is filled, preventing access of atmospheric pressure to the space above the liquid metal, the head will not feed efficiently or thoroughly as it does if left open. Pouring cold metal or pouring slowly, may result in this early and complete freezing over of the heads causing improper feeding of the castings and shrinks. Use of so-called anti-piping compounds tends to overcome this condition, but if the compound is applied after the head is solidified thoroughly across the top, it will do little, if any good.

Some such condition as that no doubt accounts for the "epidemic of shrinks" you describe. However, when such condition arises after a considerable period of satisfactory operation, it is proof positive that there has been some change in practice. The way to find out what it was, is to check each item of operation carefully until the condition causing the change appears—as it will if the inquiry is pursued diligently and with an open mind.

Removing Silicon From Scrap

Q.—Do you know of any procedure to remove silicon from scrap metal?

A.—So far as we know silicon can only be removed from bronze and brass by an oxidation process which of course, also involves the removal of other oxidizable elements. Hence, such methods can only be performed by secondary smelters who have the necessary experience and equipment to do the work with the least loss of metals other than that desired.

Dark Areas on Machined Face

Q.—We are forwarding for your attention part of a small gray iron casting showing patches of dark area on the machined face. We shall appreciate your opinion on the cause. These castings are poured from our regular gray iron mixture containing about 2.70 per cent silicon. The sample submitted has been annealed for 5 hours at a temperature of 1400 to 1500 degrees Fahr., but we have noted similar discoloration in castings which were not annealed.

A.—The high silicon content suggests the possibility that the metal may have been inoculated at the spout or in the ladle. If so, it may be that the silicon was not thoroughly and uniformly absorbed and diffused, thereby causing nonuniform graphitic formation. Looking at the problem from another standpoint the effect may be due to the skin being removed a trifle deeper over one place than another, giving a different graphitization characteristic. The rockwell hardness is about the same in the light and dark areas. This does not suggest ferrite patches, although the high silicon content does. The phenomenon is fairly familiar on large castings. At different depths of cut the change in graphite size gives a different color or appearance.

Specimen Needs Better Feed

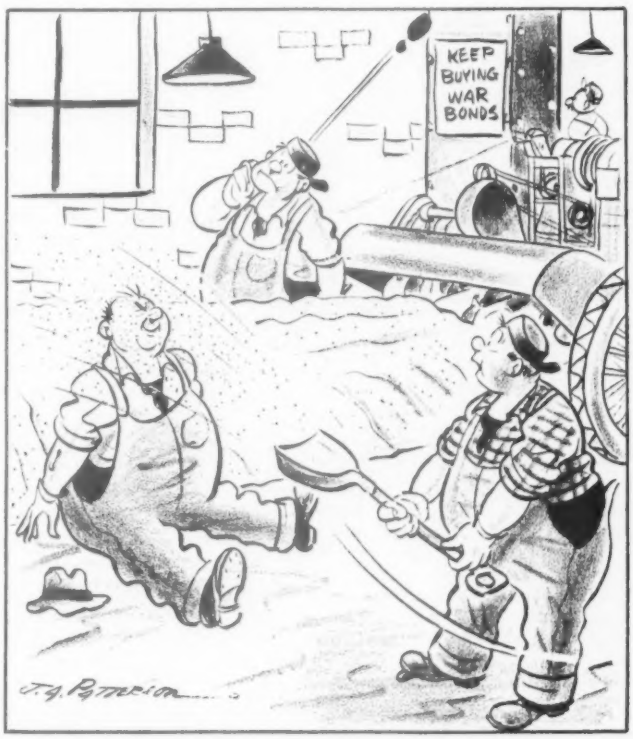
Q.—We are sending you a specimen of bronze made from scrap copper with 8 per cent tin and 6 per cent zinc. It should have a tensile strength of 30,000 pounds per square inch minimum, but it is not coming up to that. Will you look at the fracture of the sample, and give us your opinion?

A.—The fracture of the sample submitted shows a discolored appearance, particularly as it approaches the side which has been sawed away from the casting. That indicates that while the test bar was to have been fed by the casting, the latter itself was not fed sufficiently to insure the necessary feeding of the test bar. That is a common complaint since it is rather difficult to insure the proper differential temperature between test bar and casting to preclude any chance of lack of feed. The surest way to force feeding to take place is to have a riser of ample height as well as bulk so that the force of gravity is increased to the point where an increase in pressure is exerted on the feeding process.

In some instances in casting the 8 per cent tin—6 per cent zinc alloy the design of the casting is such that some parts are almost impossible to feed and consequently, will exhibit the discolored fracture when broken open. The only correction for such a condition is some way of providing the necessary temperature differential so that the part now showing the discolored fracture is cooled first, and fed from the adjoining part, and so on back to the riser. Sometimes chills are used to supply the desired temperature differential. Test bars should be located in the mold so that they are fed properly. Unless feeding is insured, the discolored fracture will appear.

GANGWAY!

By J. A. Patterson



"Ya got me—he just says it reminds him of his childhood days back in Kansas!"

Mixtures Vary for Small Castings

Q.—We shall appreciate a list of bronze alloys suitable for small statuary and art work. We have used manganese bronze, but would like to use some other alloys that have a yellow gold appearance when buffed and polished. Also we should like to have a good alloy for sun dial castings.

A.—An alloy at one time used extensively for flat table ware and known as Montana gold probably comes nearest to your specification. Composition includes copper 89.00 per cent, zinc 10.50 per cent, aluminum 0.50 per cent. However, for the castings you have in mind, where composition and physical properties are not factors of importance, any one of a wide range of alloys will serve satisfactorily. You can use all new metal, part new metal and part scrap, or all scrap if selected judiciously. Following mixtures are typical: General purpose bronze—Copper 88.5 pounds, tin 5.5 pounds, zinc 3.5 pounds, lead 2.5 pounds. This is almost the same as the familiar 85 three fives, 85 per cent copper and 5 each tin, zinc and lead.

A cheaper mixture contains copper 66.5 per cent, tin 4.5 per cent, zinc 3 per cent, lead 2 per cent, remainder selected scrap. Imitation gun metal, copper 87 per cent, lead 8 per cent, tin 3 per cent, zinc 2 per cent. For a cheaper mixture the tin is reduced to 2 per cent and the lead and zinc are increased to 8 per cent each. Cheap red brass, scrap copper wire 40 per cent, zinc 7.50 per cent, lead 7.50 per cent, machinery scrap 45 per cent. Cheap red metal, copper 83.84 per cent, lead 8.33 per cent, zinc 8.33 per cent. If the sun dials are to be covered with a coating of clear shellac, practically any nonferrous mixture may be poured into the castings. If they are to be exposed in the natural state it may be well to use the standard statuary alloy containing copper 90 per cent, tin 7 per cent, zinc 3 per cent. This also may be varied to a considerable extent. A celebrated foreign statue is made from a good grade of yellow brass, copper 75 per cent, tin 3 per cent, zinc 20 per cent, lead 2 per cent.

Turnings May Cause Gassing Trouble

Q.—We are making a 50-50 copper-lead alloy and casting in green sand molds. Metal is melted in an open-flame furnace charging borings and turnings, foundry returns, and copper in that order, and when the metal reaches 1900 degrees Fahr. the pig lead is added. Pig lead and turnings are stored outside, and sometimes are wet when charged. We have trouble with gas in the metal and poor mixing, and we would like to know whether the wet lead and turnings might have something to do with those.

A.—You do not give any details as to what your real trouble is other than to say that you have difficulty with gassed metal. Gassing of metal is accentuated materially by melting of turnings, and to avoid that detrimental effect, it has been found advisable to melt the turnings separately, pour into ingots, and use those in the furnace charge. If that is done the procedure to employ is to melt the copper first, add ingot metal from the turnings, and then the lead.

In our opinion the only trouble you would have from wet lead would be sputtering of the molten metal as it is added to the bath. Ingot or pig lead does not absorb moisture during storage; the moisture is just a coating on the surface which is turned to steam in contact with the molten metal. In the case of wet turnings with considerable moisture present, some difficulty might be encountered in producing sound ingot.

However, remelting such unsound ingot will give sound castings. Consequently, the first step in melting down wet turnings would be to dry them.

Cores Do Not Stand Up Under Service

Q.—We are having considerable trouble with the port cores in a 10 x 11 x 12 inch steam cylinder and with the small oil drain cores in the bearings of a gear case. These castings are poured from a 40-per cent steel mixture and at a temperature of approximately 2750 degrees Fahr. We have tried several core sand mixtures, from local river sand and from silica sand bonded with oil.

A.—You do not state whether the pump port cores fail to hold their shape, or are converted into a metal and sand compound exceedingly difficult to remove from the castings. Experience suggests that the second condition is responsible for your trouble. Small, thin cores surrounded by metal at a temperature of 2750 degrees are raised almost immediately to the same temperature. In this condition they become partly fused and also become impregnated with metal unless extra precaution is taken in composition and surface treatment. Cores that have served satisfactorily under similar conditions to yours are made from silica sand bonded with oil in the proportion of 1 part oil to 40 parts sand. About a handful of plumbago is added to each shovelful, but no molding sand is used in the mixture.

Coremakers are inclined to incorporate new molding sand to increase the green strength and enable the cores to stand up. Under ordinary conditions the practice is perfectly legitimate. In the present instance the clay bond in the molding sand will reduce the refractoriness of the core and thus promote fusing and impregnation. If necessary the green cores can be supported on dryer shells, or on small sand beds. Vent passages are provided in the cores preferably by the proprietary wax vents available for this purpose. Finally, after the cores are dried they are coated either with plumbago or silica wash. For the oil drain cores, it may be advisable to substitute short lengths of steel tube. For a comprehensive treatise on the subject of cores we suggest the American Foundrymen's Association publication *Coremaking Theory and Practice*, by H. W. Dietert.

Has Many Problems In Brass Foundry

Q.—We operate a foundry in South America, and would like some information on our brass casting problems. Can brass be remelted several times provided the analysis is maintained without adding new material? What are the correct pouring temperatures for the following alloys: Copper 84.4 per cent, tin 13 per cent, copper-nickel (50 per cent nickel) 3 per cent, and phosphor copper (15 per cent) 0.7 per cent; Copper 90 per cent, tin 3 per cent, zinc 7 per cent; Copper 77.7 per cent, tin 12.6 per cent, phosphor copper (15 per cent) 9.7 per cent, and copper 70 per cent and zinc 30 per cent? What is the correct permeability and moisture content of molding sand for brass castings up to 1 pound in weight? How can oxidation be prevented, and how can the molten metal be oxidized? What is the correct pouring temperature for aluminum alloy castings made in sand molds? How can oxidation be prevented in aluminum, and how can the molten metal be deoxidized?

A.—Detailed reply to all the questions in your inquiry would require more space and time than is available, so we will answer as briefly as possible. You might remelt a number of times without new material if the analysis is held, provided that the scrap does not become contaminated with iron, etc. However, it generally is wise to add some new ingot to prevent building up of undesired elements. Pouring temperatures of the various alloys mentioned will depend upon the section thickness and area of the casting. The 84.4 per cent copper, 13 per cent tin alloy may be poured at temperatures from 1950 to 2300 degrees Fahr. The same will apply to the 90 per cent copper, 3 per cent tin and 7 per cent zinc alloy, and the 77.7 per cent copper, 12.6 tin alloy. The 70 per cent copper-30 per cent zinc alloy

(*Concluded on page* 98)

ON THE MARCH
to aid Foundrymen...

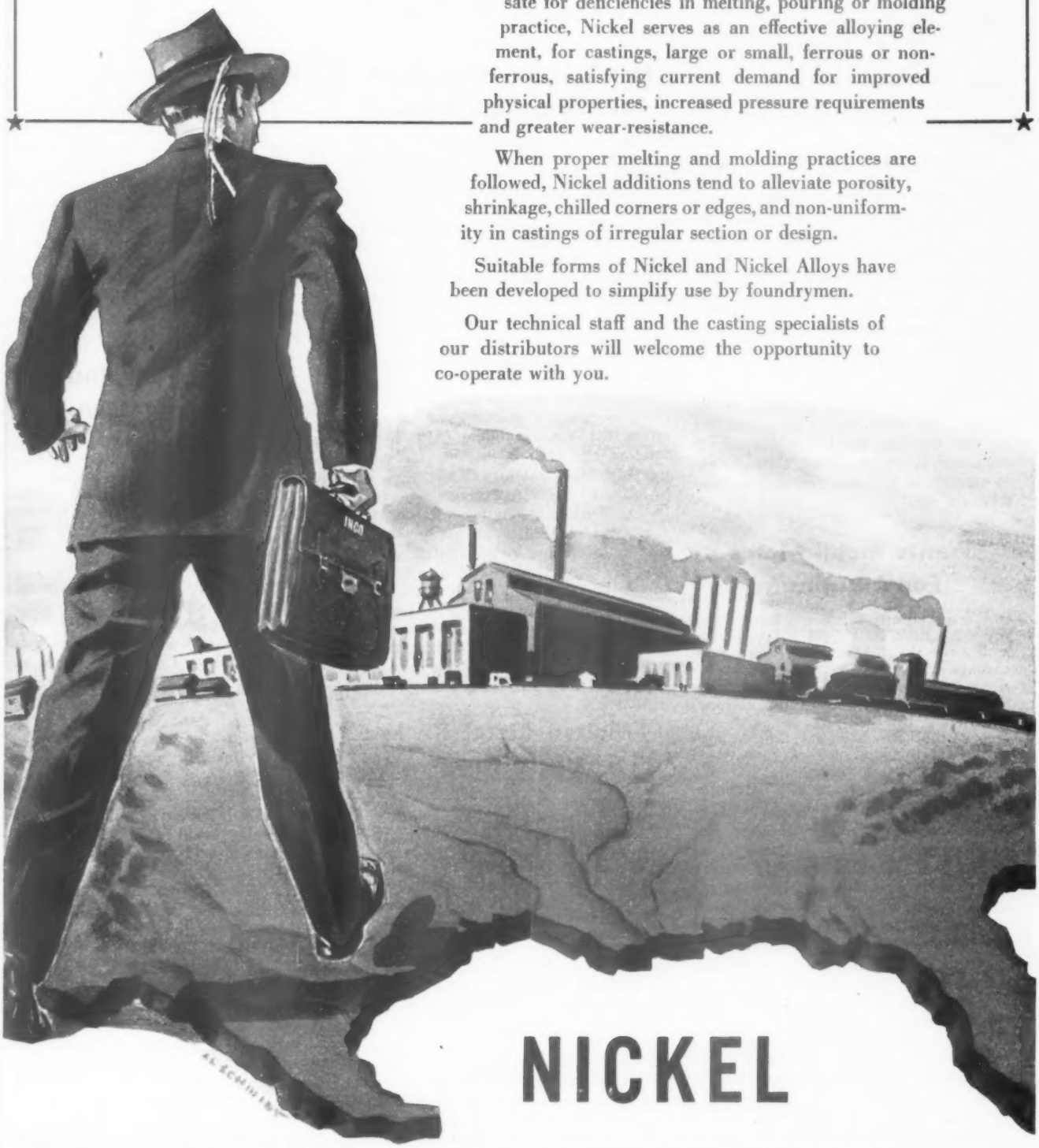
NICKEL FIELD REPRESENTATIVES are always "on the go." By reason of training and experience they are equipped to offer timely assistance on foundry problems.

While not a "cure-all" in that it will not compensate for deficiencies in melting, pouring or molding practice, Nickel serves as an effective alloying element, for castings, large or small, ferrous or non-ferrous, satisfying current demand for improved physical properties, increased pressure requirements and greater wear-resistance.

When proper melting and molding practices are followed, Nickel additions tend to alleviate porosity, shrinkage, chilled corners or edges, and non-uniformity in castings of irregular section or design.

Suitable forms of Nickel and Nickel Alloys have been developed to simplify use by foundrymen.

Our technical staff and the casting specialists of our distributors will welcome the opportunity to co-operate with you.



NICKEL

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

(*Concluded from page 96*)

should be poured around 2000 degrees Fahr.

Molding sand for the castings mentioned may have a permeability from 10 to 25, and a moisture content of 5 to 6 per cent. While you mention oxidation prevention, we believe that you probably are encountering trouble from gas absorption resulting in unsound castings which show up as small pinholes. Remedy for that condition is to melt the metal rapidly and remove from the furnace as soon as it is up to pouring temperature. If you are using coke-fired furnaces see that the ash pits are cleaned out, the grate bars open, and the flues clean so that good combustion is secured. If oil firing is employed try cutting down on the oil supply to secure a short, sharp flame instead of a long yellow one.

Aluminum alloys may be poured at temperatures ranging from 1275 to 1400 degrees Fahr. with the low temperature for heavier castings and the higher for thin-wall or intricate castings. As previously mentioned in case of the brasses and bronzes, the greatest trouble with aluminum alloys is absorption of gases, particularly hydrogen. Hence, melting practice should be such as to prevent gas entering the metal during melting. See that gases of combustion are kept away from the open top of the crucible. Do not use oily or wet materials in the charge. If solid fluxes are employed see that they are dry before use, and if degassing is accomplished through use of nitrogen or chlorine gas, also see that they are dry.

Wants Metal Molds For Aluminum

Q.—We shall appreciate any information you may have in regard to permanent molds for the production of aluminum castings. We have had no experience along this line, but we have been given to understand that castings are produced extensively by this process. Can you give us the address of any firm or firms engaged in this kind of work, from whom we might get information on the subject of molding of aluminum for permanent molds.

A.—We do not know if the last line in the inquiry is a slip in dictation, or if it is to be taken literally. If the latter, then your entire conception of the subject is mistaken. Aluminum castings are made in permanent molds, but the molds are not aluminum. They are either gray iron or steel, but they are not made according to standard design and they are not available ready made. Practically any gray iron foundry can make the iron castings and any machine shop can do the finishing and assembling, but that is not the most important feature.

The mold must be designed by an expert who is familiar with all the features involved in the permanent mold process. Cost of designing and constructing the molds amounts to a considerable sum and is justified only where the resulting aluminum castings can be produced more cheaply than by the ordinary sand casting method. Obviously, this can be accomplished only where the output of castings is sufficient to absorb the heavy initial expense. The subject is covered in a highly informative manner in a paper "Mechanized Production of Aluminum Gravity Die Castings" presented at the convention of the American Foundrymen's Association in Buffalo April 26. The paper, prepared by John Vickers, foundry manager, Rolls-Royce Ltd., was the official exchange paper of the Institute of British Foundrymen.

Has Trouble With Rust On Manganese Bronze

Q.—We manufacture manganese bronze propellers from 10 to 30 inches in diameter, and have noted that some of them after being in salt water for a few months show a distinct rust all over the blades. We purchase ingot from reliable firms and are familiar with the melting process. We will appreciate knowing if you have had complaints of that nature, and what was done to overcome them.

A.—From time to time inquiries are received on rust spots and hard spots, and their causes, but this is the first instance we recall in which the whole casting rusted. However, the difficulty in all cases is due to uncombined iron, or rather the iron combining with carbon forming iron carbide instead of combining with the metallic elements of the bronze. In cases where the manganese bronze is made by adding a hardener to the copper, it is claimed that the trouble may be overcome by addition of 0.25 to 0.50 per cent aluminum which eliminates the carbon and permits the iron to go into solution. However, you purchase ingot material which should not be troubled on that score. Our suggestion would be to get in touch with your ingot suppliers for help in solving the problem.

Molten Metal Backs Up in Risers

Q.—We are making bronze bushings weighing from 15 to 100 pounds each of leaded gun metal containing 86 to 89 per cent copper, 9 to 11 per cent tin, and 1 to 2.5 per cent lead. We have trouble with the metal backing up out of the risers and sprues. Sand used is No. 00, and metal is melted in pit and forced draft furnaces. Castings look nice and smooth, but when a machine cut is taken off they show as many holes as a Swiss cheese. Using the same metal on other castings we do not have any trouble. Cores are vented well, and on the soft side.

A.—The trouble encountered from the metal backing up through the risers and sprues is due to gassing during melting, and that is confirmed by the appearance of numerous pinholes after machining off the thin skin. The remedy, of course, is to melt under slightly oxidizing conditions, and remove the crucibles from the furnace as soon as the metal has reached the desired pouring temperature. You do not mention definitely whether the trouble is encountered from bronze melted in both types of furnaces, and suggest that you check that point. Our guess would be that the trouble is confined to the pit type, but believe that if you see that the furnace flues are cleaned out, and likewise that the ash pits and grate bars are clean the trouble should disappear.

Perhaps in some cases the tops of the crucibles are below the flue opening which permits the furnace gases to come in contact with the molten charge. If that is the case, raise the crucibles so that the tops are somewhat higher than the flue opening. Be sure that in charging the crucibles, none of the metal is allowed to extend from the top so that it is exposed to the furnace gases. Also in some cases you may be using a considerable quantity of oily borings or chips in the charge. Best procedure is to burn or wash the oil from the borings. Never place charcoal at the bottom of the pot and charge the metal on it.

Numerous fluxes are available for removing gases from copper-base alloys, but it is advisable to melt so that the least amount of the gases are present in the metal.

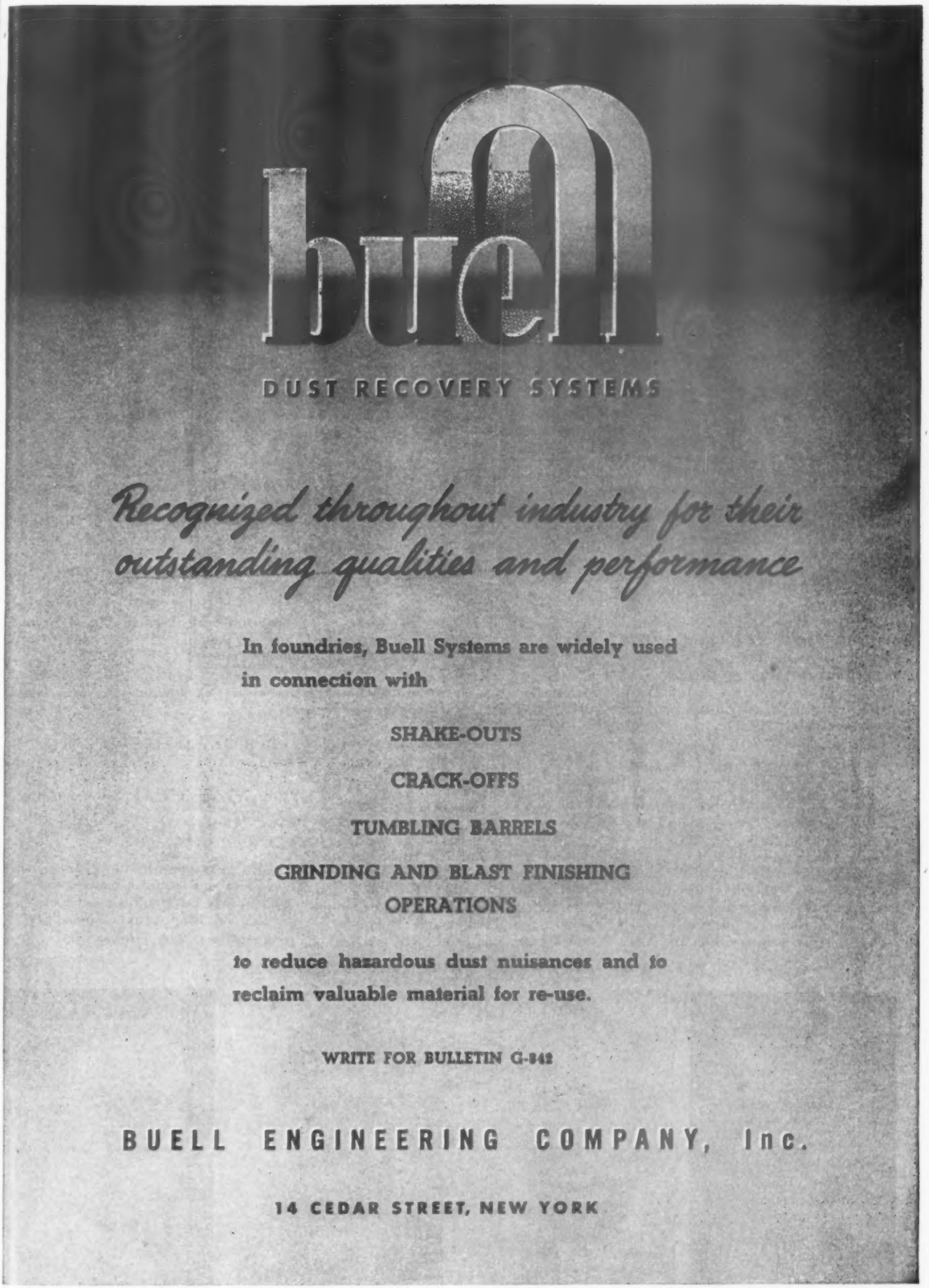
Degasify Aluminum With Nitrogen

Q.—What results can be obtained by fluxing No. 12 aluminum alloy by passing nitrogen gas through the molten metal. We are melting about 250 pounds per heat in oil-fired, alloy iron pot furnaces, and desire to eliminate if possible, porosity in unusually heavy section castings.

A.—Many aluminum foundries are employing dry nitrogen gas successfully for removal of hydrogen and other deleterious gases as well as inclusions from aluminum alloys. However, like any other procedure the best results are obtained by establishing a definite practice, and adhering closely to it. For admission of the gas into the molten metal an iron tube or pipe coated well with refractory to avoid iron pick-up may be used, but it is preferable to employ a carbon tube which is inert.

The tube should reach to within about 2 inches of the bottom of the pot, and the rate of gas flow should be adjusted so that a rolling motion of the bath is provided rather than violent agitation. The temperature of the metal should be held between 1250 to 1350 degrees Fahr. since better results are obtained in that range than at higher temperatures. Time of gassing ranges from 5 to 10 minutes per 100 pounds of metal.

It should be pointed out that the tubes used for introducing the gas may pick up moisture after standing without use, particularly over night, and it is wise to dry them out before placing in the molten metal. Also since it is comparatively easy to remove gases from aluminum and its alloys, it follows that the gases may be picked up just as quickly.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WRITE FOR BULLETIN G-842
BUELL ENGINEERING COMPANY, Inc.
14 CEDAR STREET, NEW YORK

BUY WAR BONDS AND MAKE THE AXIS BITE THE DUST

MEN . . . of Industry

THOMAS KAVENY JR., newly elected president of the Foundry Equipment Manufacturers Association, as noted in THE FOUNDRY for November, is vice president, Herman Pneumatic Machine Co., Pittsburgh. A native of Buffalo, Mr. Kaveny received his education at Duquesne University, Cornell University and the University of Pittsburgh. During summer vacations while in college, he worked for Herman Pneumatic Machine Co., and upon graduation in 1927, joined the company as a special apprentice. In 1928 he was sent to Australia, and in 1929 he traveled throughout Great Britain and Europe on sales and agency work. In 1931 he was transferred from the manufacturing plant at Zelienople, Pa., to the company's office in Pittsburgh, and was elected vice president in July, 1933. Mr. Kaveny has been active for several years in the Foundry Equipment Manufacturers Association, resigning its presidency in January, 1943, when he was made chief of the Foundry Equipment and Supplies Section, Tools Division, War Production Board, Washington. He resigned from the latter post in February, 1944.

• • •

Daniel W. Talbott has been appointed general manager of Cooper Alloy Foundry Co., Hillside, N. J. Mr. Talbott was recently plant superintendent of Symington-Gould Corp., Rochester, N. Y., and previously was with Ohio Steel Foundry Co., Lima, O., in a similar capacity. A graduate of Carnegie Institute of Technology, he has been active in the American Foundrymen's Association and the American Society for Metals.

• • •

J. B. Kintner has been appointed vice president, Union Steel Castings Division, Blaw-Knox Co., Pittsburgh. Mr. Kintner joined the division in 1936 as a sales engineer and for the past year has been manager of sales. He was graduated from Purdue University in 1925 and was formerly associated with the American Rolling Mill Co.

• • •

George C. Kiefer has been appointed chemical engineer and associate director of research, Corrosion and Castings Division, Allegheny Ludlum Steel Corp., Brackenridge, Pa. Mr. Kiefer has been associated with the company since 1916.

• • •

Murray Wheeler has been appointed plant superintendent, International Heater Co., Utica, N. Y., succeeding the late Walter G. Jones. Mr. Wheeler, who represents the fourth generation of his family to be actively connected with the Utica company, has been with International for many years in various departments of the business.

• • •

Fred A. Stewart has been appointed plant superintendent, National Malleable & Steel Castings Co., Cleveland. Mr. Stewart entered the employ of the company in 1909, in the laboratory of the Sharon, Pa., plant. He was one of the country's first melters on electric furnaces and introduced that system of melting steel at the company's Chicago and Cleveland plants. In 1918, after four years in the Chicago plant, Mr. Stewart was transferred to Cleveland as head of the melting department, and in 1924 he was made foundry superintendent. **Leslie Schuman** succeeds Mr. Stewart as foundry superintendent. Mr. Schuman joined National Malleable in 1927 as a lay-out man in the pattern shop, later doing lay-out and service work in the inspection department. In 1937 he was transferred to the finishing division and later became supervisor of surface combustion annealing. In 1943 he was appointed assistant foundry superintendent.

• • •

Oscar M. Havekotte, for the past 4 years president of International-Stacey Corp. and of International Derrick & Equipment Co., both of Columbus, O., has been elected a director of Dresser Industries Inc., Cleveland. Dresser Industries has acquired the assets of International-Stacey Corp., which will be dissolved, and of its subsidiaries, which will continue in operation. Mr. Havekotte continues as head of International Derrick & Equipment Co., now a unit in the Dresser group.

• • •

J. R. Reynolds, formerly melting foreman at Symington-Gould Corp., Rochester, N. Y., has joined General Metals Corp., Oakland, Calif., in a similar capacity.

• • •

M. E. Greenhow has been elected vice president and general manager of the Olds Alloys Co., South Gate, Calif. Engaged for many years in metallurgical

(*Continued on page* 102)

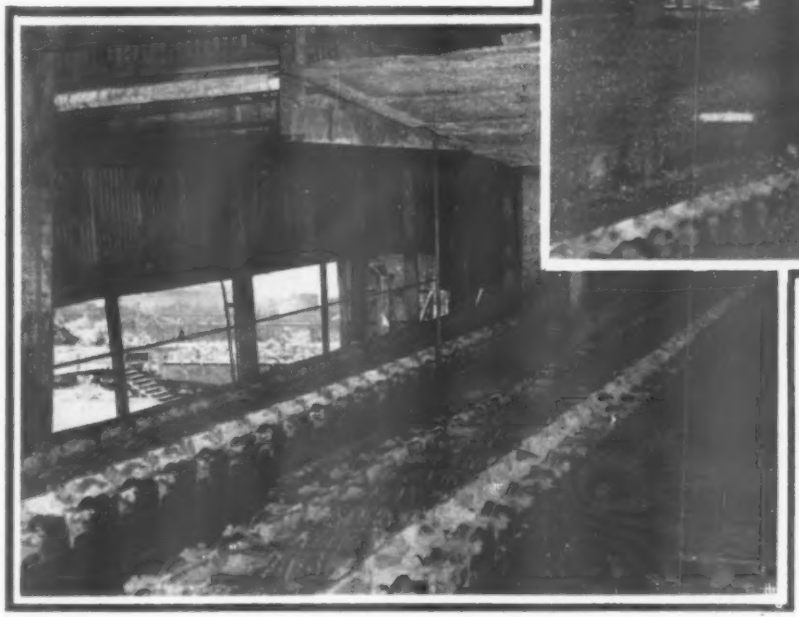
J. B. KINTNER

THOMAS KAVENY JR.

DANIEL W. TALBOTT

GEORGE C. KIEFER

Hot metal ladle pouring at the pig machine—Molten iron is completely skimmed at the trough between ladle and pig machine.



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(*Continued from page* 100)

development work and foundry practice, Mr. Greenhow for the past year had been plant and sales manager of Berg Metals Co., Los Angeles. His earlier connections include McCord & Co., Chicago; Nash Motors Co., Kenosha, Wis., and Westinghouse Airbrake Co. In 1927 Mr. Greenhow became superintendent of the Washington Iron Works, Seattle, and in 1935 he joined the Federated Metals Division at San Francisco as assistant superintendent, later becoming general superintendent of the Los Angeles plant.

♦ ♦ ♦

Harold G. Leibold, formerly chief engineer, has been appointed manager of the refractories department, Cleveland Quarries Co., Cleveland. Mr. Leibold has had wide experience in the installation of stone refractories in the foundry and steel industries.

♦ ♦ ♦

W. T. McCargo has returned to the Carborundum Co., Niagara Falls, N. Y., as eastern regional sales manager, succeeding **F. Jerome Tone Jr.,** who has been named vice president in charge of sales. Mr. McCargo was loaned to the War Department in 1940, and has served successively as consultant to the Assistant Secretary of War, chief of the Abrasive Section of the War Production Board, and government presiding officer of Abrasive Industry Advisory Committee. He had been with Carborundum Co. for 13 years as an abrasive engineer before being called to Washington, and formerly was associated with Heald Machine Co., Worcester, Mass., as a service engineer and salesman.

♦ ♦ ♦

Robert A. Epps, who for the past 12 years has worked on sand problems and other special assignments in several of the American Steel Foundries plants, has become affiliated with Stoller Chemical Co., Foundry Division, Akron, O., in a sales and technical advisory capacity.

Arthur G. Neubauer has been appointed sales manager in charge of jobbing sales, Mid-West Abrasive Co., Detroit. Mr. Neubauer, who joined the company 4 years ago, formerly was connected with AC Spark Plug Co. Inc., Flint, Mich., and McAleer Mfg. Co., Rochester, Mich.

♦ ♦ ♦

Robert B. Parker has been appointed assistant to the president of American Brake Shoe Co., New York. His duties will include sales research and co-ordination and responsibility for liaison between the company's metallurgical and research laboratories and the sales and production staffs of its 59 plants. Mr. Parker, a native of San Francisco, was graduated from Hotchkiss School and Yale University.

♦ ♦ ♦

Samuel P. George has been appointed development engineer, Milwaukee Foundry Equipment, Milwaukee. Mr. George was graduated from Purdue University in 1926 and previously had been associated with Cleveland Pneumatic Tool Co., Osborn Mfg. Co., Gogan Machine Corp., and Parsons Engineering Corp., all of Cleveland, as designing engineer and stress analyst.

♦ ♦ ♦

A. J. Schmitz has been appointed Pacific regional manager of Allis-Chalmers Mfg. Co., Milwaukee. Previous to his appointment Mr. Schmitz was manager of the Seattle office, and prior to that, manager of the Portland office. He has been with the company since 1914, and for 11 years was in charge of company operations in Cuba.

♦ ♦ ♦

Harold F. Allen has been appointed chief engineer, Link-Belt Speeder Corp., Chicago, and will divide his time between the Chicago and Cedar Rapids plants. Mr. Allen has held numerous positions of responsibility since he entered the locomotive crane division of the company in 1916. A graduate of Columbia University, he was engaged in experimental work there when he joined the Link-Belt organization.

♦ ♦ ♦

Joseph G. Magrath, until recently sales engineer in charge of product and process sales promotion division of engineering sales, Air Reduction Sales Co., New York, has been appointed manager of the Chicago district sales territory of American Machine & Metals Inc., East Moline, Ill., with headquarters at 310 South Michigan avenue, Chicago. Mr. Magrath attended Drexel Institute of Technology.

♦ ♦ ♦

R. P. M. Carmody has been appointed sales representative in the Buffalo area for Storage Battery Division, Philco Corp., Trenton, N. J. Mr. Carmody was graduated from Bliss Electrical School and University of Buffalo, and formerly operated his own agency in handling electrical and associated equipment.

♦ ♦ ♦

Frank Schryer, for 9 years superintendent of the Hamilton, Ont., plant of International Harvester Co., has been appointed plant superintendent of Mueller Furnace Co., Milwaukee. **Frank J. Nunlist,** formerly acting chief engineer, has been appointed chief engineer at Mueller Furnace Co.

♦ ♦ ♦

John Sonnenfeld, formerly connected with the Keokuk Steel Casting Co., Keokuk, Ia., has been appointed field engineer by Sterling Alloys, Inc., Boston, to handle the company's products in Missouri, western Iowa, southern Illinois, Kansas and Nebraska.

♦ ♦ ♦

Thomas M. Thornton has been appointed field engineer in Detroit, by the Norton Co., Worcester, Mass. **R. C.**

(*Concluded on page* 104)

HAROLD G. LEIBOLD

W. T. McCARGO

ROBERT A. EPPS

ARTHUR G. NEUBAUER

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Ask the Men Who Use It!

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DAYTON OIL COMPANY

DAYTON • OHIO

STEEL CORE AND MOLD WASHES • BINDER AND CORE PASTE • CORE WASHES • CHILL COATINGS

(*Concluded from page* 102)

Willey has been appointed abrasive engineer in Pittsburgh, and **Ralph E. Rasmussen** succeeds Mr. Willey as office manager of the Pittsburgh warehouse. **R. H. Langdon** has been appointed abrasive engineer for the district comprising Vermont, New Hampshire, western and southern Massachusetts and Rhode Island, and **E. L. Hurst**, field engineer for New York city and northern New Jersey.

♦ ♦ ♦

Glenn O. Carter, consulting engineer of Linde Air Products Co., a unit of Union Carbide and Carbon Corp., New York, was elected president of the International Acetylene Association at the organization's forty-fourth annual meeting, held in Cleveland, Oct. 18. **R. B. Swope**, president of Southern Oxygen Co., Washington, D. C., was elected vice president, and **Philip Kearny** and **H. F. Reinhard**, both of New York, were re-elected treasurer and secretary respectively.

♦ ♦ ♦

A. C. Reppenhagen, formerly general manager, Experimental Tool & Die Co., Detroit, has been appointed secretary of Mid-West Abrasive Co., Detroit. Mr. Reppenhagen was graduated from University of Detroit and has had 20 years' experience in business organization and finance.

♦ ♦ ♦

Ralph Woodward has been appointed sales engineer of B. C. Ames Co., Waltham, Mass. Mr. Woodward, until recently with Norton Co., Worcester, Mass., has been identified with machine tool manufacture in New England for 20 years.

♦ ♦ ♦

R. B. Jones has been assigned to help in scheduling production and shipments in the Brush Division, Osborn Mfg. Co., Cleveland. **Page A. Mead**, assistant in market development work, succeeds Mr. Jones in covering the Cleveland sales territory.

♦ ♦ ♦

George A. Pagonis, formerly assistant superintendent of the sand casting foundry, Permanente Metals Corp., Permanente, Calif., has been appointed superintendent.

♦ ♦ ♦

A. B. Kinzel has been appointed vice president, Electro Metallurgical Co., New York. Mr. Kinzel was formerly chief metallurgist of Union Carbide & Carbon Corp. Laboratories, New York.

♦ ♦ ♦

A. P. Lee, consultant to the Gray Iron Castings Section, Forging and Casting Branch, Steel Division, War Production Board, has returned to Bethlehem Steel Corp., Bethlehem, Pa., where he is foundry specialist in the pig iron sales department.

♦ ♦ ♦

Harry S. Ransom has been appointed special representative in the Pittsburgh district for Ohio Steel Foundry Co., Lima and Springfield, O. Mr. Ransom has represented Ft. Pitt Steel Casting Co., McKeesport, Pa., in the Pittsburgh area for the past 15 years.

♦ ♦ ♦

Ralph M. Hinckley has been appointed abrasive engineer in the Milwaukee territory of Norton Co., Worcester, Mass. Mr. Hinckley was formerly grinding wheel specialist with the John Pritzlaff Hardware Co., Norton distributor in Milwaukee.

♦ ♦ ♦

Ray E. Cross, formerly metallurgist, Magnesium Fabricators, Adrian, Mich., has been appointed chief metallurgist and process and development engineer, Maryland Sanitary Mfg. Co., Baltimore, Md.

♦ ♦ ♦

Dan A. Sutch, formerly foundry superintendent, Vulcan Iron Works, Wilkes-Barre, Pa., is now metallurgist with Wickwire Spencer Steel Co., Buffalo.

♦ ♦ ♦

Frank H. Smith, foreman of the pattern department, Lima Locomotive Works Inc., Lima, O., has been elected president of the Lima Foremen's Club.

♦ ♦ ♦

L. B. Neumiller, president, Caterpillar Tractor Co., Peoria, Ill., has been elected a member of the board of trustees of Illinois Institute of Technology and Armour Research Foundation.

♦ ♦ ♦

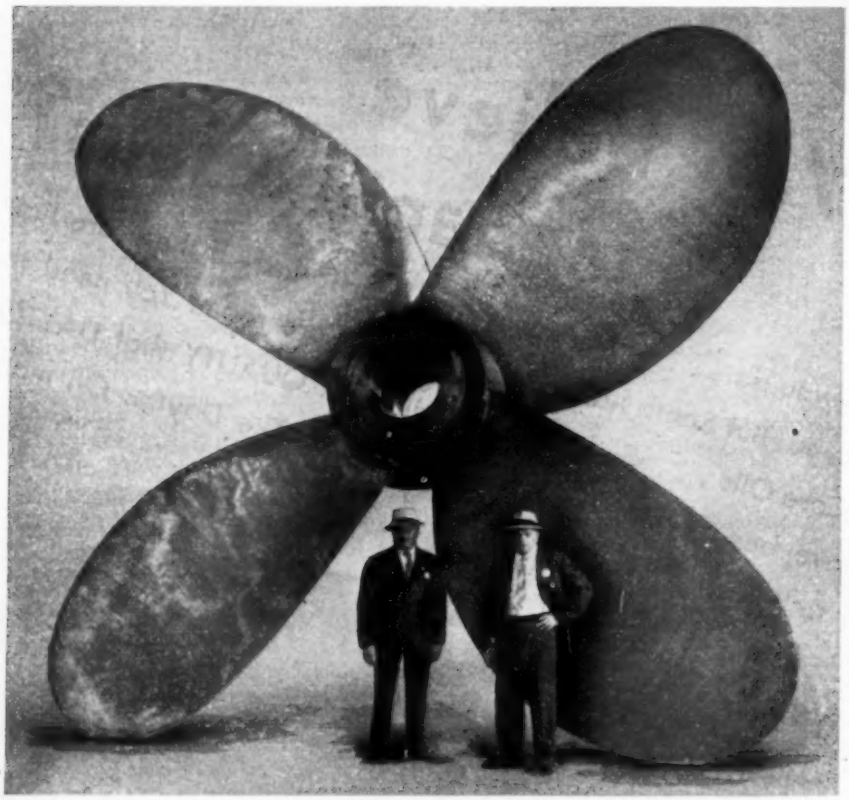
Thomas Burtch, who has been western representative of the Army Air Forces branch of the Smaller War Plants Corp. in Los Angeles, has been appointed regional director of SWPC, Chicago, to succeed **Don W. Walters**, resigned Sept. 15.

♦ ♦ ♦

William S. Hogg has been appointed to the midwestern sales staff of the Philco Corp. Storage Battery Division, Trenton, N. J., with headquarters in Cincinnati.

♦ ♦ ♦

Lee F. Sickler, formerly associated with Ampco Metal Inc., Milwaukee, has been appointed works manager, Maysteel Products Inc., Mayville, Wis.



30-TON PROPELLER: *One of the series of six manganese bronze propellers recently cast by the Cramp Brass & Iron Foundry Division of the Baldwin Locomotive Works, Eddystone, Pa. The propeller, 22 feet in diameter and weighing approximately 60,000 pounds, is the largest and heaviest casting of this type made up to the present in the United States. The propellers are destined for use on a fleet of ocean-going combination cargo and ore carriers*

Save Casting time UP TO 50%

"Faster in all 3 Departments!"

1 GET FASTER FORMING!

Truline cores ram quickly, giving dense cores with freedom from sagging. *This means more cores per hour per core maker!*

2 GET FASTER BAKING!

Truline cores harden under low oven heat, dry without oxidation. Oven-time is less, output greater!

3 GET FASTER CLEANING!

Truline cores burn out readily. Core sand shakes out easily, saving valuable clean-up time.

IT'S A LOT OF SATISFACTION to turn out a big order of castings . . . every last one of them true to core dimensions, sound as a dollar! And it's mighty pleasant, too, to have them out on time . . . that certainly rings the bell with the Army, the Navy—whomever you're doing work for! Specify Truline Binder and watch your production climb! The coupon below brings complete information, use it today.

TRULINE BINDER

Reg. U. S. Pat. Off.

HERCULES POWDER COMPANY
INCORPORATED
999 Market St., Wilmington 99, Delaware

Please send ☐ sample ☐ information on how to use Truline Binder in casting:
(state type of work and kind of metal cast)

Name _____ Title _____
Company _____ City _____ State _____
Address _____ NB-60

GRINDING WHEEL MARKING

System Developed

DESIRABILITY of a uniform system for marking grinding wheels long has been recognized both by wheel manufacturer and consumer. While numerous attempts have been made in the past without being entirely satisfactory, a committee of the Grinding Wheel Manufacturers Association made a careful study of previous work and developed a system of standard markings which has been adopted by members of the association to go into effect Dec. 1, 1944. Purpose and scope of the standard follow:

This standard applies to grinding wheels and other bonded abrasives: Segments, bricks, sticks, hones, rubs, and other shapes, which are tools used to remove material, alter shape or size, produce a desired surface or accuracy of dimension, or a combination of these objectives.

The standard does not apply to diamond wheels or to specialties such as sharpening stones where radically different symbols are commonly used and are familiar.

The standard establishes a symbol for each of the most essential characteristics of a grinding wheel, and arranges these symbols in uniform sequence.

This is a standard system of markings only. Wheels bearing the same standard markings if made by different wheel manufacturers may not and probably will not produce the same grinding action. This desirable result cannot be accomplished because of the impossibility of correlating any measurable physical properties of bonded abrasive products in terms of their grinding action.

Each marking will consist of six parts, placed in the following sequence: 1—Abrasive Type. 2—Grain size. 3—Grade. 4—Structure. 5—Bond type. 6—Manufacturer's record.

Abrasive—Abrasives naturally fall into two distinct groups, namely the aluminum oxide group and the silicon carbide group. Letter symbols are used to identify these two groups, as follows: A—Aluminum oxide. C—Silicon carbide.

Where it is necessary to designate some particular type of these broad classes, the manufacturer may use his own symbol or brand designation as a prefix.

Grain size—Grain size is indicated by a number. The following list (from coarse to fine) includes all of the ordinary grain sizes commonly used in the manufacture of grinding wheels. It conforms with Simplified Practice Recommendation R118-40.

10, 12, 14, 16, 20, 24, 30, 36, 46, 54 60, 70, 80, 90, 100, 120, 150, 180, 220

The following additional sizes are occasionally used: 240, 280, 320, 400, 500, 600.

If and where it is necessary to indicate a special grain combination, the wheel maker may use an additional symbol appended to the regular grain symbol.

Grade—The grade is indicated by a letter of the alphabet, A to Z, soft to hard, in all bonds or processes.

Structure—The use of a structure symbol is optional. If and where it is advisable to indicate the structure in a wheel marking, a simple number symbol shall be used. Numbers from 1 to 15 will cover the range of structures being used today, but there is no reason why higher numbers cannot be used if necessary. Progressively higher numbers are used to indicate progressively wider grain spacing (sometimes called "more open" structure).

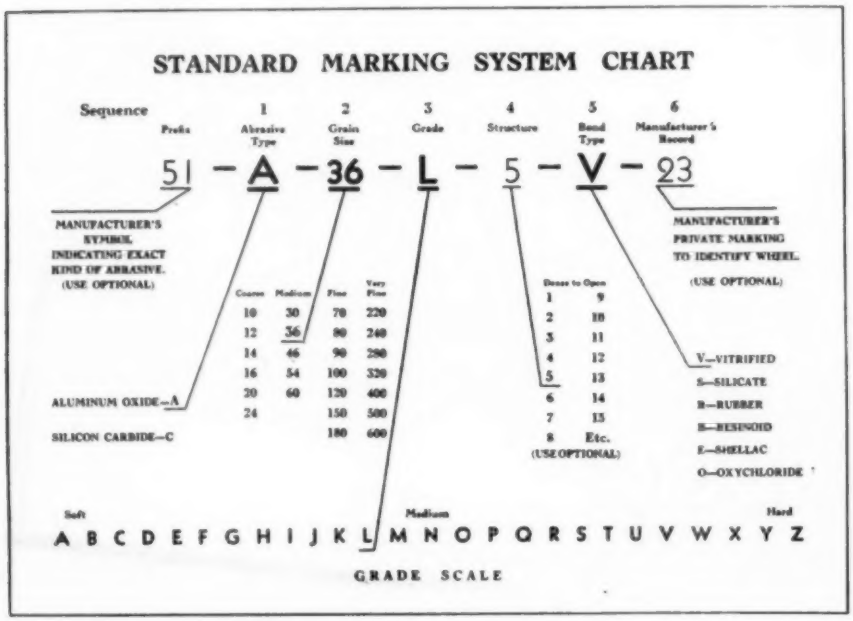
Bond or Process—The bond or process is designated by the following letters: V—Vitrified. S—Silicate. E—Shellac or elastic. R—Rubber. B—Resinoid (synthetic resins). O—Oxychloride.

Manufacturer's Record — Manufacturer's records are designated by symbols. Each grinding wheel manufacturer is at liberty to use the sixth position for private factory records.

Where the standard method of marking differs materially from the old form, it may be advisable to use both the old and the new markings during the introductory period, and perhaps for a considerable time thereafter. This would enable the user to become accustomed to the conversion gradually.

Where wheels are too small to permit the use of the complete marking, the grain and grade marking alone may be used on the wheel, or the marking on the wheel itself may be omitted entirely. Where this is done the complete marking (including the dual marking where necessary) shall be indicated on tags or labels accompanying each container.

Due to the greater similarity in marking that will result in many cases from the use of this system, it is important that the user include in his records the name of the wheel maker as a part of the marking.



Battelle Activities Portrayed

Scope of the work being carried on by Battelle Memorial Institute, Columbus, O., is graphically portrayed in an attractive publication, "Research In Action," recently issued by the institute. Marking completion of Battelle's 15th year, the booklet reviews the organization's growth from an original staff of 30 to 600 today and its technical developments during the period. Major activities of the institute are described with the aid of numerous illustrations.

Redesigning Foundry

(*Concluded from page* 78)

Final chipping and grinding operations are performed with hand grinders or chipping hammers.

Castings weighing less than 500 pounds are dipped in varnish before shipping to protect the surface against rusting in transit or storage.

The rearrangement of the foundry has resulted in a great deal of interest from foundrymen outside the company. This, we feel, is due to the fact that an attempt has been made to mechanize a jobbing foundry. The results obtained to date indicate that the objectives have been realized.

Panel housing of the Ross Overhead Oven baking cores for aircraft magnesium engine castings.

Insert — Ross continuous overhead trolley type oven used for drying core assembling paste.

For

Baking-Pasting *aircraft engine cores*

ROSS OVENS

Baking—3700 lbs. per hour

Pasting—4800 lbs. per hour

Quantity production—Uniform baking—Paste drying!! Equipment to meet all these requirements for magnesium engine cores was essential to one of the world's largest aircraft manufacturers. The Ross baking and drying ovens illustrated are doing the job.

The overhead Ross core baking oven and the overhead Ross trolley oven for drying the paste to assemble the multiple-piece cores are heated by Ross direct fired air heaters, oil fired, and the Ross-slotted duct method of circulating air is employed to insure maximum uniformity in baking and drying.

The selection and use of Ross Ovens for this important and exacting production job is another testimonial to their advanced features of design, construction and operation.

You can rely upon recommendations by Ross for your Core Baking, Paste Drying, Heat Treating and Foundry Ventilation problems.

ROSS SYSTEMS

J.O.ROSS ENGINEERING CORP.

350 MADISON AVE., New York 17, N. Y.

CHICAGO – 6
201 North Wells St.

BOSTON – 9
79 Milk St.

DETROIT – 3
12953 Greeley Ave.

ROSS ENGINEERING OF CANADA, LTD., Dominion Square Building, Montreal, P. Q.

CARRIER-ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

CONTROL OF AIR FOR MODERN INDUSTRY

No. 8 Mexican Graphite lowers chill depth and Brinell hardness, increases deflection and machinability

Photomicrograph from broken half of 1.25 inch arbitration bar of grey iron not treated with No. 8 Mexican Graphite. Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 4.5 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties:

Transverse Strength	2,497 lbs.	Total Chill Depth 41/32 in. (wedge bar)
Deflection	0.23 in.	Clear Chill Depth 26/32 in. (wedge bar)
Brinell Hardness	229	

Photomicrograph from broken half of arbitration bar of same base iron as above but treated with 1 lb. per ton of No. 8 Mexican Graphite. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties:

Transverse Strength	2,907 lbs.	Total Chill Depth 13/32 in. (wedge bar)
Deflection	0.31 in.	Clear Chill Depth 10/32 in. (wedge bar)
Brinell Hardness	217	

As is clearly revealed in photomicrographs (see panel), the addition of 1 lb. of No. 8 Mexican Graphite per ton reduced chill depth and Brinell hardness, increased deflection and thereby improved machinability.

In every foundry where it is used, No. 8 Mexican Graphite produces similar improvements in finished castings. Machinability is greatly improved and the cost of metal control is lowered.

No. 8 Mexican Graphite is an especially prepared product, dustless and free of volatile matter. Packed in 100-lb. bags for easy handling, No. 8 Mexican Graphite effectively improves grey iron castings at a cost of less than 10c per ton.

If you are interested in treating your grey iron easily and at low cost, increasing machinability and obtaining a higher percentage of perfect castings, it will pay you to make ladle additions of No. 8 Mexican Graphite to your iron. Send us your casting problems and we will be happy to offer recommendations without obligation.

No. 8
Mexican Graphite

THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

foundry DEVELOPMENTS

DETAILED study of mechanical test results of a number of cast steels in conjunction with data gathered during melting and pouring has been made by H. T. Protheroe and reported to the Iron and Steel Institute (London). Study involved 48 heats of steel of which 9 each were made by the basic high frequency process, basic electric arc, and acid high frequency; 3 each by acid electric arc and acid openhearth, and 15 in tropenas converter. Protheroe concluded that combined phosphorus and sulphur percentage affect mechanical properties to a much greater extent than do other factors such as casting temperature, etc., and the property most affected is impact value. Unsoundness as indicated by blowholes or porosity has a pronounced effect on ductility as measured by reduction of area and elongation. Effect on tensile properties depends to a large extent on actual location of the defect in the test piece. There is an indication that casting temperature under controlled conditions may have a slight effect on mechanical properties. Its influence is so weak that unless effect of other factors is completely eliminated, it is not noticed. Micro-structures of cast steels do not differ appreciably and give no indication of mechanical properties to be expected. Differences in macrostructures are quite distinctive, but do not indicate what mechanical properties are to be expected. Influence of other factors such as nature and distribution of inclusions, grain size, method of manufacture, etc. also were considered, but could not be correlated with mechanical properties.

♦ ♦ ♦

CARE OF solid rubber tires on industrial power trucks may increase the life 70 to 80 per cent. Principal causes of tire deterioration are oil and grease, imbedded chips and hard jolts on obstructions and pitted floors. Those cause unequal wear of rubber and the tires go out of round. One satisfactory method developed at Warner & Swasey Co., Cleveland, for reconditioning lumpy tires is to remove the high spots by turning in a lathe, making the circumference true with the center of the wheel. Cutting tool should be ground with considerable rake or clearance, and should present a fairly sharp edge as compared to a tool for turning steel. Rigidly clamped into the tool post, the sharp edge is fed into the tire at an upward angle. Make cut 1/16-inch or less deep using a slow feed with lathe chuck turning between 300 and 500 revolutions per minute. Imbedded chips should be removed by hand before turning where that can be accomplished without leaving a large hole. In many instances the tool will remove the chips without trouble.

♦ ♦ ♦

WATER-BLAST tumbling barrel recently introduced has been adopted by several foundries for cleaning brass and bronze castings. The barrel rotates on and is supported by a single shaft attached to the back or closed end. During rotation the barrel is tilted upward. Trunnions on the side allow it to be tipped downward for unloading while the barrel still is rotating. The blasting gun mounted in a hinged front cover plays a high velocity stream of sand and water on the castings. It is claimed the process imparts a smooth, velvety surface to the almost hygienically clean castings.

♦ ♦ ♦

ONLY in comparatively recent years has serious consideration been given to the proper reconditioning of foundry sand. Unless the hot, contaminated sand is reconditioned thoroughly it will cause blisters, blows, scabs, drops and washes on the castings with resulting increased cost and loss of time in the cleaning room and machine shop and frequently actual loss of the castings. Many foundries still employ antiquated and inefficient methods. Experience indicates that there are six requisites for proper sand reconditioning. All six must be present: 1—Elimination of contamination, including scrap, gaggers, burned cores. 2—Reduction of the sand to a smooth, even texture free of lumps. 3—Proper blending of old sand, new sand and bond. 4—Proper and uniform distribution of moisture. 5—Establishing the proper degree of permeability. 6—Adequate aeration to remove steam and gas and produce an open texture. Many pieces of mechanical equipment have been developed in recent years and now are available for properly reconditioning molding sand.

♦ ♦ ♦

CASTING conditions play an important part in the resulting structure of thick cylinders produced by the centrifugal process and spun on the horizontal axis according to an investigation by Northcott and Dickin and reported in the July 1944 issue of *Journal* of the Institute of Metals (London). Alloys examined included aluminum—6 per cent copper, 6 per cent tin bronze, and 70-30 brass. In general small crystal size was favored by low casting and mold temperatures, high mold speed, and slow pouring. Surface quality improves as speed increases. With very low mold speeds the surface quality is poor, and the bore of the cylinder casting is irregular and likely to contain entrapped air holes; splashing of the liquid metal in the mold occurs owing to the long pick-up time, and this results in circumferential zones of segregate. Splashing is reduced by slow pouring, but an unduly prolonged pouring time leads to a cold-lap type of defect.

♦ ♦ ♦

INVESTIGATION to determine the influence of melting conditions on steel castings indicates that when the combined sulphur and phosphorus contents are over 0.09 per cent, the steels are inferior in impact resistance, and other properties whether in the as-cast, annealed, or normalized and tempered condition.

♦ ♦ ♦

CHEMICAL resistance of carbon and graphite to practically all corrosive fluids recently was taken advantage of in construction of the central chimney of the new laboratory and office building of St. Lawrence Alloys & Metals Ltd., Beauharnois, Que. Construction required that gases from furnaces and testing equipment in the basement be carried off through a brick chimney in the center of the building, and since some of the gases were corrosive and others explosive, two flues of 8-inch, inside diameter, threaded carbon pipe were used to form the inside of the chimney. Joints were sealed with carbonaceous cement with the female joints in the upward position. Gases are exhausted mechanically and to prevent liquid backdrip due to snow and rain, top of the chimney was roofed over with side outlet. Bottom of the flue is slanted with a small pipe for drainage.

♦ ♦ ♦

USE OF chemical treated cellulose as an addition to core sand in steel foundries is claimed to eliminate trouble from cracks, veining, finning and penetration. One mixture used successfully for cores for banjo housing castings was composed of 1600 pounds crude silica sand, 15 gallons cellulose, 4 gallons bentonite, 3 gallons cereal binder, 2½ per cent iron oxide compound, and 6 per cent moisture. For general steel casting work the following mixture is suggested: 1600 pounds crude silica sand, 20 gallons cellulose, 5 gallons cereal binder, 1 gallon iron oxide compound, 2½ gallons core oil and 6 to 7 per cent water.—E. B.

Wheelabrator ENABLES DODGE MANUFACTURING CORP. TO REALIZE NUMEROUS SAVINGS

Above—The 48" x 48" Wheelabrator Tumblast operating in the Dodge foundry assures low-cost speedy cleaning production.

Right—The Wheelabrator Tumblast automatically unloads onto this belt conveyor and the cleaned parts are carried to the sorting benches.

This installation has enabled Dodge Manufacturing Corp. to realize numerous savings as outlined by H. B. Voorhees, Asst. Foundry Supt., in the letter on the opposite page.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

MANUFAC-
NUMEROUS

DODGE MANUFACTURING CORPORATION
Engineers and Manufacturers

NEW YORK
CHICAGO
PHILADELPHIA
SAN FRANCISCO

MAIN OFFICE AND PLANT
MISHAWAKA, INDIANA

MINNEAPOLIS
ATLANTA
DALLAS
NEW ORLEANS

October 7, 1944

American Foundry Equipment Company
Mishawaka, Indiana

Gentlemen:

In the six months that we have had our 48" x 48" Wheelabrator Tumblast in operation, we have realized a number of savings which I feel sure you will find interesting.

SAVES MANPOWER

Prior to the installation of the Wheelabrator Tumblast we were dependent upon a battery of tumbling mills and an air blast room for the cleaning of our gray iron and semi-steel castings. To handle our production with this equipment we operated the room two full shifts, with much of the work handled unsuitable for this type of cleaning. Now we need operate the room for only a part of one shift and then only for castings too large for the Tumblast.

SAVES FLOOR SPACE

Nine of the tumbling mills have now been eliminated. In the floor space resulting we have moved our grinding and finishing room. The Wheelabrator Tumblast unloads onto a slat conveyor with the parts being carried to the sorting benches. This eliminated a laborious and costly handling problem.

SPEEDS PRODUCTION

A typical Wheelabrator Tumblast load consists of 52 light duty sheeve castings each weighing 47 pounds for a total weight of approximately 2500 pounds. This quantity of work is cleaned in 8 to 10 minutes whereas several hours had been needed to rattle the same amount of work.

IMPROVES QUALITY

In addition to faster and cheaper cleaning we are experiencing another tangible benefit in that babbitt will adhere to the surfaces of Wheelabrated bearings much better than it did to a rattled surface. The #18 grit produces a thoroughly cleaned matte finish to which the babbit is permanently bonded.

Probably no other single piece of equipment installed in our foundry has done so much to facilitate the flow of work through our plant. The Wheelabrator Tumblast is now an indispensable piece of equipment in our foundry.

Yours very truly,

DODGE MANUFACTURING CORPORATION

H. B. Voorhees

H. B. VOORHEES
Asst. Foundry Supt.

POWER TRANSMISSION, MATERIALS HANDLING AND SPECIAL EQUIPMENT

ARMY E NAVY
THE AMERICAN MOLDER
TRADE MARK REG. U.S. PAT. OFF.

American
FOUNDRY EQUIPMENT CO.
505 S. BYRKIT ST. MISHAWAKA, IND.

around DETROIT

BY A. H. ALLEN
Detroit Editor,
The Foundry

Building up of alloy residuals in iron and steel scrap is giving concern to steel foundries as well as steel mills. . . Detroit Chapter committees beginning to plan activities for forthcoming 1945 A.F.A. convention

ALLOY residuals in scrap iron and steel, steadily built up in the past 3 years because of the large tonnage of alloy steel going into war production, are causing some speculation about the future of steel castings. The situation parallels that in the case of the wrought steels where already the problem of alloy residuals—0.30-0.40 per cent of such elements as nickel, chromium, molybdenum—is causing headaches for mills producing open-hearth steel for deep-drawing sheet and strip. The small amounts of these alloys cannot be oxidized from the bath, and because of their hardening effects are likely to cause cracking and breakage when the steel is deep drawn. There is also a pronounced age hardening effect on flat-rolled steel containing these alloy residuals. Effort to overcome the latter trouble by aluminum killing the steel to stabilize it have been successful.

Speculate on Future Trends

In the foundry field, the question becomes one of whether the future trend in steel castings will be toward higher alloying or toward water quenching and drawing for desired properties. In the latter direction much important progress has been made during the war period. Because alloys will be present in so much of the available scrap and because small alloy additions have proved so effective as far as improving hardenability is concerned, the trend would appear to be in the direction of more alloying, but there is far from universal agreement on this.

Triple alloy steels of the present NE grades in the wrought steel field, may logically be extended to steel castings; in fact, a committee of metallurgists is now considering such a possibility. Whether this could be extended eventually to gray iron is another interesting point to contemplate.

It is a strange commentary on the times to note that alloy elements in steel, introduced as premium-carrying additives, change their guise completely when they appear in scrap and are considered contaminants. Large tonnages of alloy scrap currently are a drug on the market and can be sold only with difficulty at any price.

Soundness of castings has always been a prime consideration in their acceptance. A casting which outwardly might appear perfect could prove defective because of porosity or blowholes in the interior. X-ray inspection techniques were developed to detect such interior defects and foundrymen looked to their molding, pouring and cooling techniques to get rid of entrapped gas in castings.

Discussing this matter recently, a steel foundryman in Detroit introduced a new angle. He said—and the bulge in his cheek was not tobacco—the reason the foundryman worked so hard to eliminate blowholes was simply one of economics. He could not afford to sell castings full of holes at the prevailing per-pound price so he filled up the holes with metal to obtain a heavier casting on which he could realize a profit. General consensus veers to the belief the best place for the blowhole is at the taphole.

Get Ready for Convention

Detroit is readying plans for entertaining the spring convention of the American Foundrymen's Association, April 30-May 4, and the local chapter committees have begun to shape up various phases of the activity, meanwhile keeping their fingers crossed on a number of contingencies. Uppermost of course is the touchy labor situation which, like a German robomb, is liable to explode anywhere or backfire with disastrous effects. Just recently, for example, hotel chefs and cooks decided they were going to cook no more dinners for special parties at hotels unless they had a hike in pay first. This decision came at a particularly bad time, for on the succeeding day an elaborate banquet had been arranged to honor General H. H. Arnold, head of the Army Air Forces, and about 1500 tickets had been distributed to a long list of automotive notables and their friends.

By dint of urgent pleading on the part of hotel officials, the War Labor Board (which had refused to approve pay increases), the War Manpower Commission, union leaders and others, the chefs at the last minute relaxed for this one occasion and said they would prepare the dinner. So overjoyed were the banquet arrangers that after the crowd was seated and before the first course was served, two head chefs were brought up to the speakers' table and ceremoniously introduced to General Arnold and the co-guest, Lieut.-Gen. W. S. Knudsen.

So, if things remain the way they are today, foundrymen can look forward to most anything upon their arrival in Detroit next April. The city is so swollen with people who have migrated from other areas to taste some of the fat money which war plants here are dishing out that the normal pattern of living has been completely disrupted. Possibly the war in Europe may be history by spring—everyone hopes so—but there is no guarantee. Even if it is, things will be far from settled around Detroit, for the readjustment period likely will be even more difficult than the present boom-time.

Visitors to Detroit likely will be particularly interested in plant visitations and while at the moment the outlook is not too promising, in a few months it may be possible to schedule plant inspections more readily than now. At any rate, every effort is being made to pry loose a representative list of Detroit area plants, both in and out of the strictly foundry category, for inspection.

Improve Foundry Conditions

Remarks made here last month on the subject of attracting young men to careers in the foundry industry and the work which a Detroit group has undertaken in this direction may have been subject to some misinterpretation. Representatives of the group have explained they recognize the trend toward mechanization in foundry operations and know that it will go even further; but they feel something must be provided for the workman and the prospective workman to take the place of the old "pride of craftsmanship" which has been characteristic of skilled labor in foundries. This is what they are trying to develop in their approach to such things as good housekeeping, public relations efforts, better working conditions and better pay.

Such constructive effort is of course all to the good and there was no intent by this writer to deprecate the program, for obviously the industry must develop a new generation of workmen and artisans, if it is to survive and progress. The only point which we sought to make was the observation that the foundry industry in recent years has moved into a new phase, where the skill of the indi-

(*Concluded on page* 114)

SPRING MOUNTED

IS THE ANSWER!

For shock loading or where very heavy loads must be handled on Roller Conveyer, Mathews Spring-Mounted construction should be considered. Spring-Mounted Roller Conveyer is made in three styles, and is establishing service records in heavy industries all over the United States and Canada. Your Mathews Field Engineer can explain how it works and why the Mathews design is superior to other available types of Spring-Mounted Roller Conveyer. He can tell you how its application has minimized the costly maintenance which is usually necessary on Roller Conveyer used under very severe conditions. You will readily understand how the principle of pre-compression protects the bearings and axles of the rollers, yet, at the same time, prevents any bouncing action from taking place. Descriptive literature is available on request.

Mathews Conveyer Company ELLWOOD CITY PENNSYLVANIA

(*Concluded from page* 112)

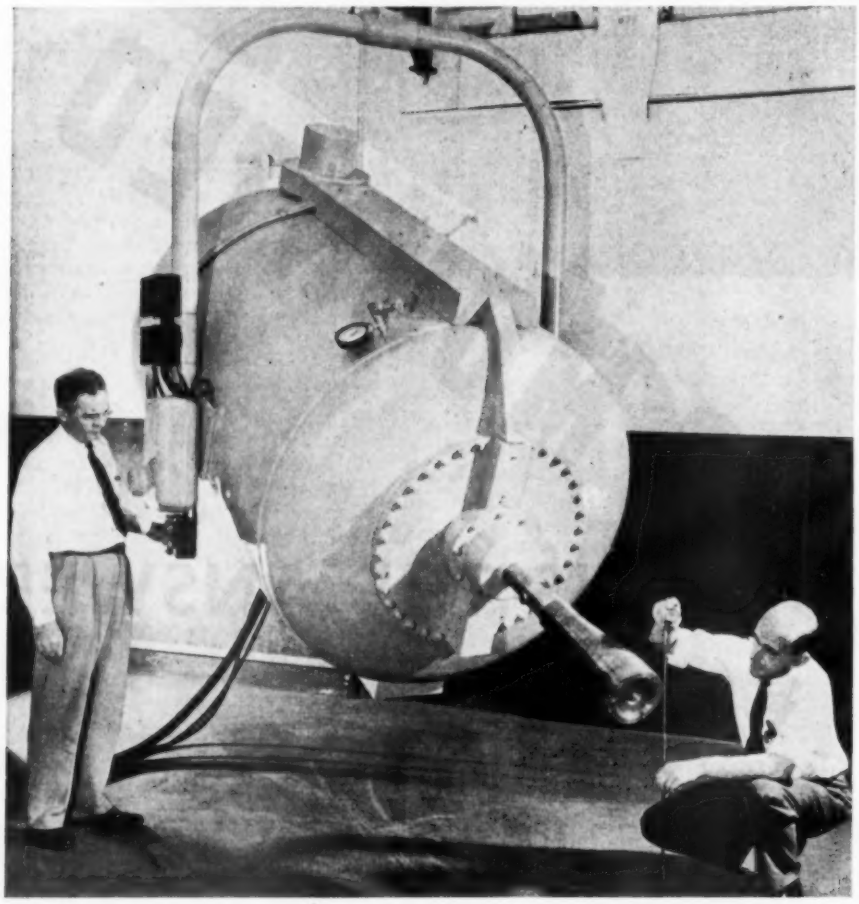
vidual had been transferred to the machine, and while present personnel problems appear grave, possibly the compacting of the industry which most surely will follow the war will relieve some of the present concern. This is not to suggest that forward-looking moves toward improving relations with employes and humanizing jobs in foundries are futile.

Today there is general discouragement among many foundry operators and managers over employe attitudes. As one official expressed it, "Men today are totally lacking in incentive, work only for the next payday, and bicker endlessly over trivialities." This is not a situation peculiar to foundries; it is common in nearly all large industrial plants and more than anything else reflects the fact there is an oversupply of jobs for the available amount of labor.

It is possible a 35 per cent drop in the overall level of production would correct quickly such lack of co-operation on the part of labor. When there is a line of men outside a plant employment office, those on the inside are apt to work a little harder and to show more interest in what they are doing. Certainly it is folly to expect the present high level of employment and low level of productive effort can be maintained profitably in the postwar period.

The Michigan state health department has initiated a program at Michigan State College, Lansing, Mich., to conduct experiments on refractory mold materials and mold surface coatings with the idea of perfecting new mold compositions which will circumvent the dust hazards incident to sand molds. Practical foundrymen do not regard the proposal with much hope, and see little chance of removing all dust hazards as long as refractory materials are being used. Recognition of the dangers of dust in the foundry is nothing new, and the health department might make further progress by investigating methods of removing dust than by trying to pull any rabbit out of the hat in the form of a new type of mold.

Practically all new foundries and a considerable number of older foundries have installed dust removal equipment in recent years.



2,000,000 VOLTS: *Dr. Ernest E. Charlton (left) and Willem F. Westendorp check the 2,000,000-volt x-ray outfit developed in the x-ray section of General Electric Research Laboratory. This unit doubles the voltage of x-rays formerly available for examination of metal sections. In radiographing one 8-inch steel casting the new outfit made the exposure in 3½ minutes, compared with 4½ hours required with a million volts. This reduced time also is important in obtaining correct exposure of specimens having sections of varying thickness or different materials. High voltage likewise permits placing the machine far back from the specimens, thereby covering a larger area and reducing distortion of the pictures*

A.F.A. Nominating Committee Named

At a recent meeting of the executive committee of the A.F.A. board of directors, the 1945 nominating committee was appointed to select candidates for the annual elections of national officers and directors. The elections will be held, as in past years, during the annual meeting of the association in Detroit the week of April 30-May 4.

The nominating committee consists of the following: Chairman, Duncan P. Forbes, Gunite Foundries Inc., Rockford, Ill.; Lee C. Wilson, Reading Steel Castings Division, American Chain & Cable Co., Reading, Pa.; W. E. Mahin, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.; Charles Morrison, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich.; Martin J. Lefler, Strom Brass Foundry, Elkhart, Ind.; R. K. Glass, Republic Steel Corp., Buffalo; Edward P. Trout, Lufkin Foundry & Machine Co., Lufkin, Texas; Henry McFarlin, the Lunkenheimer Co., Cincinnati; John W. Porter, American Steel Foundries, East Chicago, Ind.

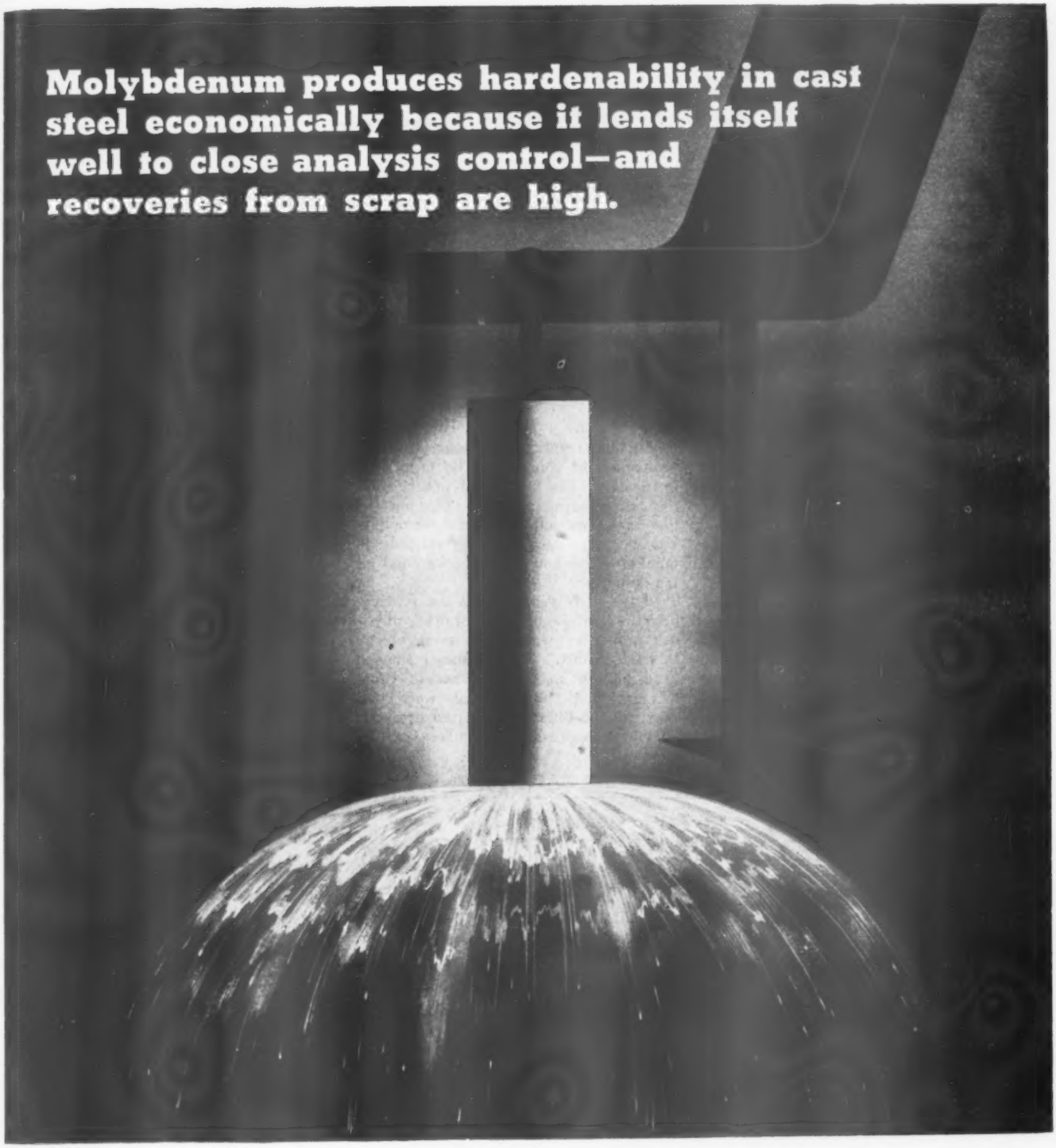
Meehanite Research Institute Meets

About 200 representatives of the member foundries of the Meehanite Research Institute of America Inc., New Rochelle, N. Y., attended the sixteenth annual meeting in New York Nov. 1 to 3. The program included presentation and exchange of research information as developed by member foundries, and the study of service records of wartime applications of meehanite castings in India, Australia, Africa, Great Britain and South America.

The following officers were elected for 1945: President, Oliver Smalley, Meehanite Metal Corp., New Rochelle, N. Y.; first vice president, H. B. Hanley, American Laundry Machinery Co., Rochester, N. Y.; second vice president, A. C. Denison, Fulton Foundry & Machine Co., Cleveland; secretary-treasurer, C. S. Nichols, Meehanite Metal Corp., Chattanooga, Tenn.

Shipments of Light Metals Decline

Shipments of both aluminum and magnesium castings continue to decline, according to reports by WPB. In July, latest month reported, shipments of magnesium sand castings totaled 5,650,000 pounds, against 5,729,000 in June and comparing with the March peak of 7,574,000. Shipments of permanent mold castings reversed the trend, rising to a new high of 656,000 pounds. Total shipments of aluminum castings in July were 38,700,000 pounds, against 42,400,000 in June and the lowest since August, 1943. The all-time high was reached in March, 1944, with 49,500,000 pounds.


Molybdenum produces hardenability in cast steel economically because it lends itself well to close analysis control—and recoveries from scrap are high.

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MOLY

By A. J. SMITH
Lunkenheimer Co.
Cincinnati

Test Specimen for Nonferrous Castings

This is the first of two articles from a paper presented at the annual meeting of the American Society for Testing Materials held in New York in June. Second section will appear in the January issue

SELECTION of suitable test specimens from which the properties of metallic materials may be determined has long been of interest. Proper sampling is a very real problem, and many factors must be taken into account in securing a sample which may be considered representative. In many cases, representative samples may be secured very simply, as in the case of structural shapes and bar stock. In other cases, more particularly in castings, it would be very hazardous to state that the test specimen is truly representative of the part without making a destructive test of the part itself.

Unfortunately, a leading difficulty in production of a suitable test specimen lies in the conflict of opinion between producer and consumer. The term "unfortunately" has been used not because the two groups are at variance on the theoretical grounds of proper sampling, but because each has formulated an opinion without a proper background on the subject.

In the early years of the last century, both in this country and abroad, physical properties were of interest chiefly to the scientist. The consumer showed little interest in physical tests[1]. From this early work, however, data were compiled on the different materials available on which engineering formulas could be based. Mild interest was taken in tensile strength by some engineers, but it was not until Kirkaldy's work in about 1860 that the importance of such a factor as ductility was impressed on engineering minds.

From this time on, the testing of materials took great strides with consequent assembling of many data and development of most of our present engineering formulas. At the same time the desire to check the new formulas arose among the consumers, especially in the Army Ordnance Department. This led to the installation of a 400-ton Emery machine at Watertown Arsenal in 1875, largely through the instrumentality of Col. Theodore T. S. Laidley. Many destructive tests were made on this machine, by which the Ordnance Department could check the quality of purchased materials. With publication of these data there was a trend among other consumer interests to specify grades of materials purchased. Chief among these were the railroads.

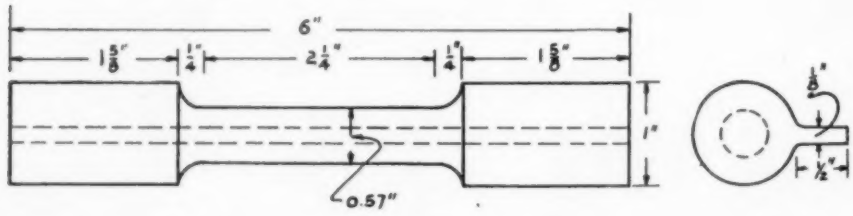


Fig. 1 (Above)—Test specimen for 88-10-2 castings, as cast

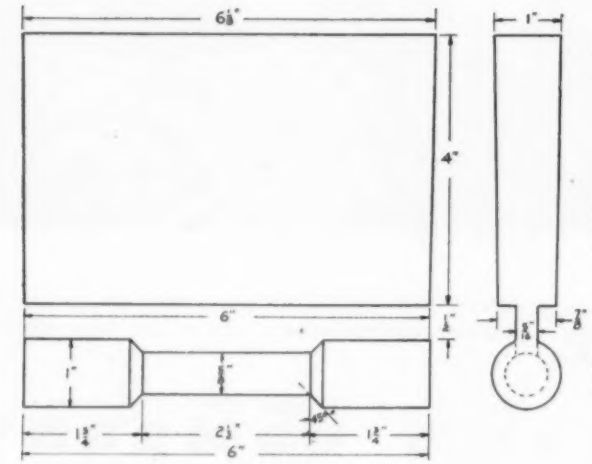
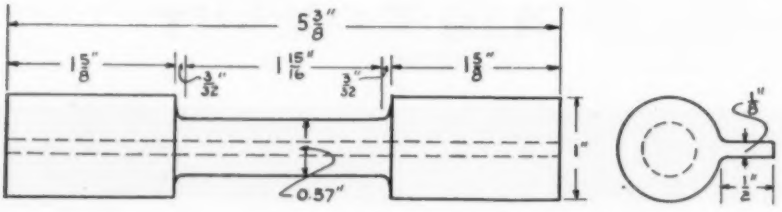


Fig. 2 (left) — Test specimen coupon of A.S.T.M. Specification B60

Fig. 3 (below)—Test specimen of A.S.T.M. Specification B10



Had To Improve Methods

With consumer specifications to meet, it was incumbent on the producer for competitive reasons to improve his methods or alloys to meet the specification. In this connection and at this time (about 1880) a board was appointed to survey the potentialities of various materials including alloys of copper, tin, and zinc[2]. Tests were made on transverse test bars 1-inch square, 22 inches between supports. Tension test specimens 0.798 inch in diameter were machined from the transverse bars of both ferrous and nonferrous metals.

The trend here is clearly evident. The work of Kirkaldy and the earlier works of Hodgkinson, Barlow, and others established the requirements needed for engineering design calculations. Elaborate and what were considered to be fairly precise formulas were worked out, on the basis of the data obtained, which found their way into engineering text books and eventually into building and other codes.

Nevertheless, repeated failures led to the study of full-scale service parts. For example, the collapse of the Ireland Building in 1893 occasioned tests of ten different cast iron columns, including those from the building, which ultimately showed Gordon's formula to be incorrect on both theoretical and practical grounds the calculated strength of the columns in the building being 128 per cent greater than their actual strength. Since this and many other engineering formulas are em-

(*Continued on page* 178)

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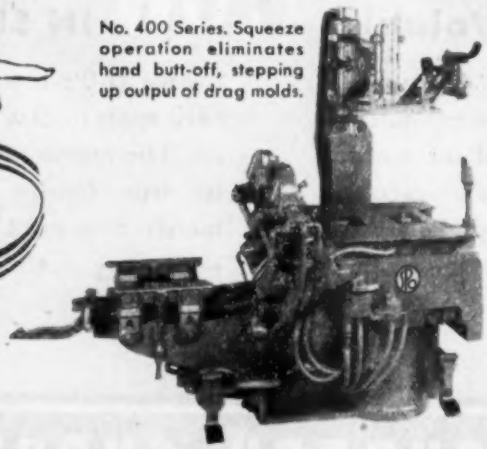

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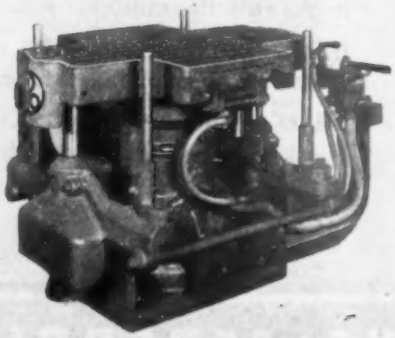

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READERS' COMMENT • • •

"Mere Cast Iron"

To the Editors:

A statement by Louis Bromfield, page 78, in the October issue of the *Readers Digest* seems to indicate that he would escape a considerable amount of ridicule if he confined himself to his own trade. In discussing a new type agricultural tractor he offers several free-hand comments which show that he is as good at picking up fictional and old exploded statements as he is in reeling out his own line. For example: "Most farmers will agree that the development of agricultural machinery has lagged. Machinery often was clumsy and made of cheap and low grade stuff, sometimes MERE CAST IRON."

That weak, brittle cast iron snake has been scotched so freely and completely in recent years, one would think rumors would have penetrated even the dense jungles of misinformation where fiction writers flourish and spawn.

If it was not for the impossibility of injecting information into a place where desire for information does not exist, one might point out that approximately 3000 foundries in this country are engaged in the production of iron castings to the extent of approximately 10,000,000 tons per year, castings that measure up to expectation in a highly satisfactory manner.

Mere cast iron. Indeed!

J. J. Gallagher

Route 3 Wooster, Ohio

Tellurium on The Mold

To The Editors:

Have just read your article in the November issue of The Foundry relating to production of chilled iron by tellurium additions and found it interesting. However, we want to question the broad statement regarding the application of tellurium to the mold surface "permitting the production of hard, wear-resistant surfaces at any localized area on the casting."

In some tests with which the writer is familiar tellurium powder was used in the core wash for cores of small cylindrical castings. When these castings were broken there was much more chill on the cope side than on the drag side, and not at all uniform. We then looked up the melting point and boiling points of tellurium and found them to be: Melting Point, 846 degrees Fahr. and Boiling Point, 2530 degrees Fahr.

We feel that the tellurium is volatilized and migrates to the cope side so that very little success would be had in trying to produce localized chill on the drag side of a mold with tellurium. The castings we were working on were about 6 inches long, 3 inches outside diameter, 2¼ inches inside diameter.

We were also interested in the pictures of wedges showing a ring of white iron instead of the normal white tip, since we saw the same type ring on wedges produced in an iron to which 1 per cent impure copper shot had been added. The copper contained less than 1 per cent total of tin and lead, but this small amount increased the shrinkage of the iron drastically in addition to showing the unusual wedge test.

We produced the same type chill test by using pure copper, pure tin, and pure lead; and found that both tin and lead as impurities in copper added to gray iron have adverse effects on the physical properties even in these small percentages.

Earl Beyerlein
Metallurgist

Hansell-Elcock Co.
Chicago

Should Handle With Care

To the Editors:

The article on page 89 of the November issue of The Foundry has been read with interest, and the writer agrees with Mr. Crout in most of his statements concerning the chill produced in gray cast iron by the use of tellurium as a ladle addition or mold and core wash. The chill is composed of primary carbide and pearlite as is a normal chill produced by rapid cooling, but there is no densening of the gray iron behind a tellurium chill.

A word of caution is necessary in the use of tellurium as a chilling agent. As a ladle addition the tellurium must be well mixed with the iron, or a spotty chill will result. As a mold or core wash, thorough experimentation should be done before using it in production, and care must be taken that the wash is not too thick or of too high concentration in tellurium. The tellurium chill or the wash apparently has the property of becoming detached from the mold or core surface before the metal has solidified and floating to unwanted places in the casting.

The writer has in mind an experience with a tellurium wash used in a cylinder block casting. Trouble was being had with porosity where two cylinder walls met in a twin cylinder, and a tellurium wash was applied to the water jacket core in this region to produce a chill and counteract the slight shrinkage. On breaking up some blocks treated in this way, a chill about ⅛-inch deep was found where the wash had been applied, but the chill was not continuous. Where there were gaps, it was found that pieces of white iron of the same size and shape were located in the center of the cylinder barrel wall and on the inside face of the cylinder barrel wall. This inside face is machined, of course, to form the cylinder barrel, and the attitude of the machine shop can be imagined. In all of the castings made, pieces of white iron were located at random in this manner, and the experiment was stopped with instructions to keep all tellurium mold and core washes out of the foundry where castings were to be machined. The porosity, incidentally, was eliminated by molding a small iron chill into the core at the proper spot.

Obviously, washes must be used with extreme care. The question of using scrap with tellurium in it for remelting in the cupola is also a pertinent one. Most of it is probably oxidized and removed as gas or in the slag, but the element is so very potent that the small quantities to survive the melting process may cause trouble.

The tellurium chill is very stable thermally, which may lead to useful applications, but for that reason tellurium must be handled with extreme care in a malleable foundry.

It is not the writer's intention to detract from the value of Mr. Crout's article as tellurium is very useful in certain applications. But tellurium must be handled very carefully and more should be known about its effects and its behaviour in remelting before it is used widely in the industry.

Publication of this letter or its contents should not deter experimentation with the use of tellurium in gray cast iron, and may prevent some unfortunate experiences.

J. E. Rehder
Metallurgist.

Grinnell Co. of Canada, Ltd.
Toronto

Foundry Publicity

To the Editors:

The foundry industry has been receiving a lot of publicity of late, due to the manpower shortage in the foundries. This has appeared in the newspapers, a number of magazines, and we have heard it frequently over the radio. It should be gratifying to the foundryman to know that at last "the powers that be" have come to recognize that the foundry business is vital to our war program and maybe to our peace time economy.

At the same time, however, certain unfavorable publicity has come from a number of sources in regard to poor working conditions in the foundry industry. This has hampered the recruiting of labor and many foundrymen have been greatly disturbed by it. No doubt some of these reports have been exaggerated but maybe there is some foundation for many of them.

Anyone familiar with the industry for the past 25 years or so can recall a number of examples of poor working

(*Continued on page* 122)

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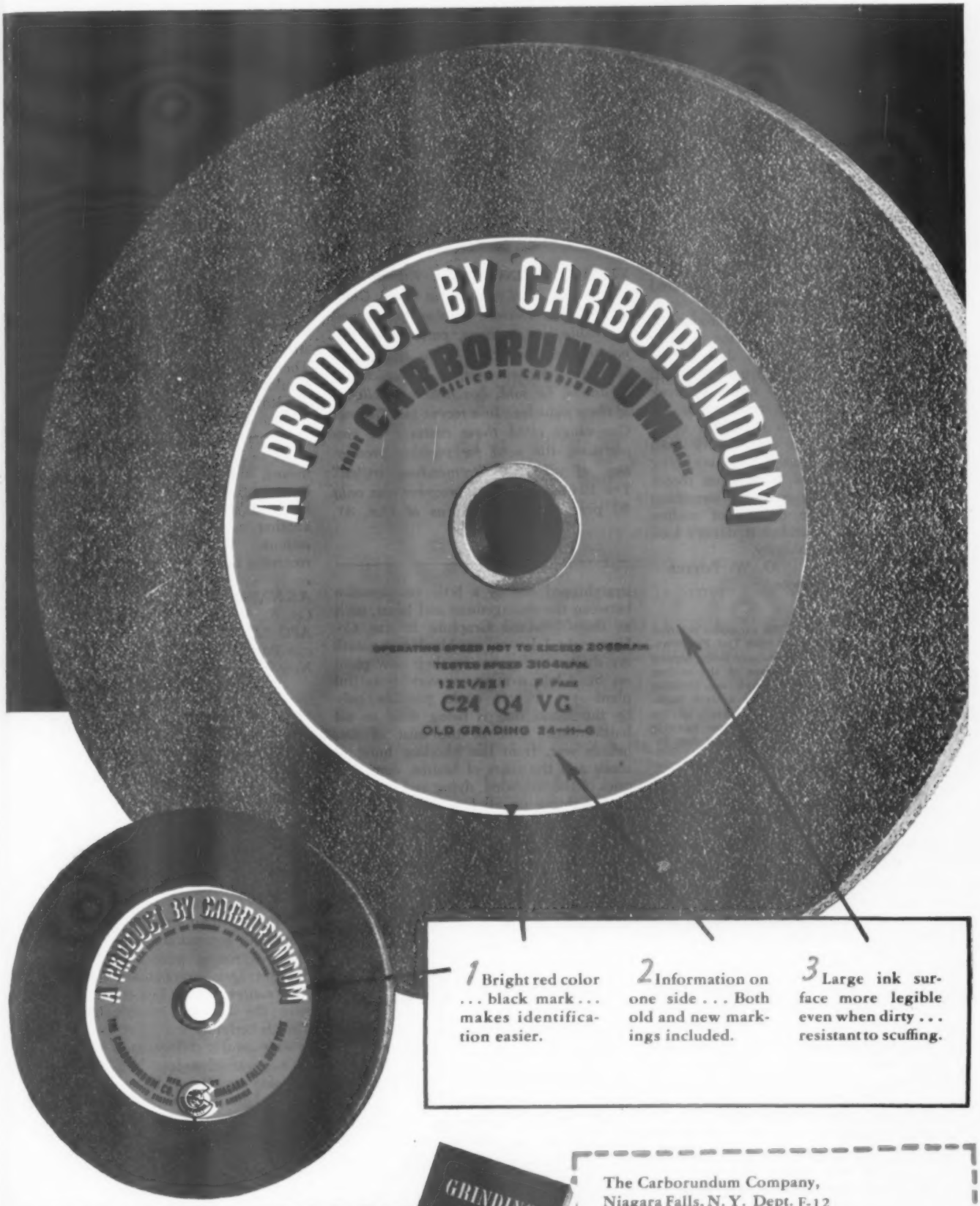

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(*Continued from page* 119)

conditions in some foundries. While there has been great improvement in recent years some bad conditions still exist. Once a poor reputation is established it is hard to erase it, and just a few examples here and there may establish the reputation for the whole industry.

There is one thing that is poor publicity for the foundry industry that has bothered me for years and that is the photographs and cuts that appear in the technical press and in catalogs of some of the equipment manufacturers. These frequently show molten metal being tapped from a furnace or being poured into a mold. The molten metal stands out distinctly but the background is dark and indistinct, giving the impression that the foundry is a dark dreary place. This has been true too often, but why advertise it? Who wants to work in a place where one can hardly see his way around, when there are many plants that are light and cheery with attractive surroundings? I am enclosing a couple of samples taken from recent publications. There may be something romantic about the display of molten metal in this manner but it doesn't look to me like good publicity.

O. W. POTTER
University of Minnesota
Minneapolis.

EDITOR'S NOTE: One of the examples referred to by Mr. Potter was clipped from THE FOUNDRY. The photograph showed the furnace being tapped and was shot against the glare of the molten metal. The resultant photograph was artistic, but did leave the impression of a dark background. However, another photograph of the furnace room reproduced on the same page as the one indicated by Mr. Potter showed that department was well lighted.

A Soldier Speaks

TO THE EDITORS:

I'd like to express my humble thanks to THE FOUNDRY, a magazine in which I am interested very much. Before coming to the battlefield of France I was employed by Chase Brass & Copper Co., Euclid, O., in the casting department. In the few moments that I have, THE FOUNDRY has offered me great relaxation in reading what is going on in the foundries back home.

I worked in one of the most modern brass plants in the world and was very much surprised to see how far the countries overseas are behind us, one could say a hundred years. I've always read and heard so much about the German equipment, yet from what I've seen their engineers will stick to the old traditional ideas, while the American will elaborate them. The cover of the June issue hit the nail right on the head, although before we can think of the postwar world we first must win this war.

Nothing is more disgusting to us boys overseas than to read in the *Stars & Stripes*, which is a soldier's paper printed by the Army, of how many companies are out on strike or are arguing over small, simple matters which could be straightened out by a little co-operation between the management and labor, such as the Cleveland Graphite Bronze Co. Last night I lay on my blankets beneath my shelter-half picturing their new plant on St. Clair avenue—a very beautiful plant—yet it was made possible only by the blood that is being shed on all battlefronts. Out of the mist of this hellish war, from the blinding burst of shells and the roars of bombs, come the cries of the wounded, dying and from soldiers fighting on all fronts, the plea for more food, clothing and equipment. In the face of this picture those at home, endowed with all the comforts, strike for higher wages and over a few petty ideas which could be settled afterwards.

There are several good reasons why we fight on the battle fronts: (1) Against the idea of the master race; (2) Against the idea that man was made for the State rather than the State for man, and (3) Because we do not want to be dominated and ruled by another nation who would make slaves of us. Yet there is a simpler reason than the above: We are fighting because we must fight. When some one punches one in the nose there's nothing to do but fight back.

The Axis and Allies are at war with each other, and only one can be the winner. If we lose it will be because the ones at home spend more time talking than producing the articles of war for the front line man who is doing the fighting with body and soul instead of just words. What would happen now that we are entering Hitler's paradise, which he claimed no enemy soldier would ever set foot upon. Supposing we'd stop because we'd like to eat steaks instead of "C" or "K" rations which every soldier hates and bitches about, or because we have to lie in a fox hole while the Jerries above us are dropping their calling cards (bombs) or because we have to sleep, eat and move like gypsies, or because we have to fight and work anywhere from 10 to 24 hours per day. I cannot see why those at home can't see that we're fighting for our lives, that this is a war of survival. If we don't fight this war with everything we've got and win we won't live to discuss the kind of a world we'd want to live in after this war has spent itself.

Plain common sense shows us that if we'd stop fighting we'd learn what we're fighting for. I'll bet there isn't one of those strikers or those who cannot decide issues among themselves, who would change places with us boys on the front because they've got a yellow streak down their backs a foot wide. There isn't a man on the front who wouldn't go to work and trade places just to get away from this eternal hell for the paradise at home and work for army pay only. I had to come 3000 miles to learn what the word "America" means, and no one at home will ever know until it has been taken away from him. It's getting near chow time—another can of beans, stew or hash—rations. Will be looking forward to receiving the next issue of THE FOUNDRY.

CORP. LOUIS M. WICK
A.S.N. 35068168
Co. F., 1303 *Eng. Regt.*
APO 527
c/o Postmaster
New York, N. Y.

VITAL CASTINGS: *Col. Emerson L. Cummings, chief engineer at office, Chief of Ordnance-Detroit, displays four small malleable iron castings, parts of an important component of heavy trucks and lack of sufficient supply of which on occasions, he said, has held up delivery of these vehicles. In a recent talk Colonel Cummings cited these castings in emphasizing the need for pushing production of all such "tremendous trifles." The* 1944 *heavy truck program was only* 60 *per cent completed as of Oct.* 31, *he stated*

Manpower Shortage?

TO THE EDITORS:

Farsighted men in the foundry industry have expressed concern over the fact that college men do not seek employment in foundries. A study of this condition was made by several men who were well qualified to carry on such a survey. These reports were published in THE FOUNDRY, *Transactions of the American Foundrymen's Association* and in private communications. The general ideas expressed were that college men did not seek employment in foundries. As a matter of fact, few college men ever gave the foundry consideration at all. That is certainly true. Yet, we know that a wide-awake college man can advance in a progressive foundry. The foundry can also benefit by utilizing the engineering background of the college graduate.

The casual reader of the foregoing will probably reason like this. With so few college men going into the foundry business, opportunities should be plentiful for the college-trained man who is willing to work and apply himself. Unfortunately, this is not entirely true. For example, I am a college man. In the Chicago area, foundries are undermanned. The WMC made a plea for foundrymen. With this in mind, I sought a position in a foundry. The first step was the compilation of a list of foundries where my talents could possibly be

(*Concluded on page* 173)

RADIOGRAPHY
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DIFFRACTION
STRESS ANALYSIS
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PHOTO LAYOUT
ELECTRON MICROGRAPHY
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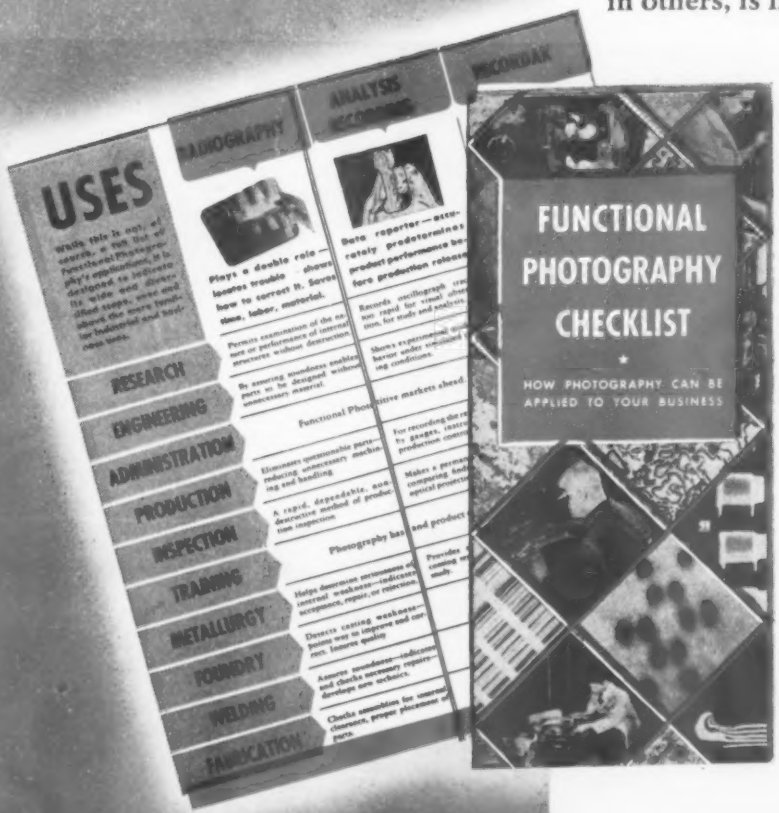
IMPROVE...SPEED...SAVE

FOR example, photo layout speeds the production of casting patterns... spectroscopy gives an accurate, fast analysis of every melt before it is poured . . . radiography guides the design of lighter, simpler castings, points the way to more efficient technics, assures delivery of a sound product.

Yes, in the foundry, at many important, specialized jobs, photography is proving its worth; and the scope of its applications is increasing rapidly, well beyond its general use in illustrating reports, recording gating technics, and other familiar operations. In fact, foundrymen everywhere are realizing that the usefulness of functional photography in their business, as in others, is limited only by the ingenuity of the user.



ARE YOU TAKING FULL ADVANTAGE OF FUNCTIONAL PHOTOGRAPHY?

WE have prepared a Checklist which indicates the diversification of photography's uses in industry . . . perhaps it will suggest new ways in which photography can go to work for you. To obtain your copy of the Functional Photography Checklist, write to Eastman Kodak Company, Rochester 4, N. Y.

Kodak

Hamilton Helps To Familiarize Public

WITH FOUNDRY INDUSTRY

WITH the commendable view of familiarizing the public with various phases of the foundry industry, product, personnel, method of operation, the basic part it plays in supporting the nation in war and peace and the opportunities it offers in the way of careers for the rising generation, the Hamilton Foundry & Machine Co., Hamilton, O., under the direction and inspiration of Peter Rentschler, president, was host to a group of women public school teachers from the city of Hamilton, recently.

A similar affair was sponsored on May 5 when the Hamilton Men Teachers Club visited the foundry for a plant tour, supper and a lecture by the plant chief engineer. His talk on gray iron was illustrated by slides and a display of the wide line of miscellaneous castings made in the plant. The technical lecture was followed by a presentation of general interest moving pictures, principally of war activities in various countries. The program was concluded by the presentation of a film showing the ceremonies incident to the presentation of the Army-Navy "E" flag sometime before in recognition of the outstanding performance and record established by the company. At the meeting each man received a copy of the Ives Committee book "The American Story of Industrial and Labor Relations" originally planned as a textbook for use in New York state high schools. Each visitor also was given a small souvenir casting supporting a staff and 4 x 6-inch American flag.

A third group which visited the foundry on May 24 included 61 members of the Butler County Bankers' Association from Hamilton, Middletown, Oxford, Somerville, Sevenmile, Monroe, also the superintendent of banks and the secretary of the Ohio Bankers' Association from Columbus, O.

At each meeting before the technical address of the chief engineer, Mr. Rentschler talked to the group of visitors on the subject of lung diseases in the foundry. This was in response to many inquiries from men and women who, from superficial reading, were under the impression that foundry work was an exceedingly hazardous occupation. By way of explanation the speaker outlined the general subject of tuberculosis in its many ramifications including the silicosis feature that for one reason and another attained such a wide measure of unfavorable publicity in recent years. Equipment in the Hamilton foundry, and methods of operation are designed to remove dust hazards and maintain the health of the employes. Prospective employes are given a thorough physical examination including an x-ray determination of the condition of the chest and respiratory organs. The examination is repeated at semi-yearly intervals.

For Cleaning *Faster, Better* and at *Lower Cost*
Choose from the SLY Complete Line of Foundry Cleaning Equipment

SLY TUMBLING MILLS

1. Heavy forged steel trunnions, extra heavy roller bearings.
2. Special door locks — easily operated.
3. Extra heavy gearhead motor.
4. Integral motor platform.
5. Loading and unloading from either side.

SLY BLAST CABINETS

1. Two lights mounted at front to illuminate castings.
2. Operator's eyes shielded by protective hood.
3. Easy loading and unloading of castings.
4. Used for thorough cleaning of small and intricate parts, or as an auxiliary to larger units.

SLY BLAST ROOMS

1. Overall down-draft ventilation.
2. Ample illumination.
3. Lined throughout with 3-16" wear plates.
4. Floor of grating and perforated plates.

SLY AIRLESS BLAST CLEANING EQUIPMENT

MILLS AND TABLES

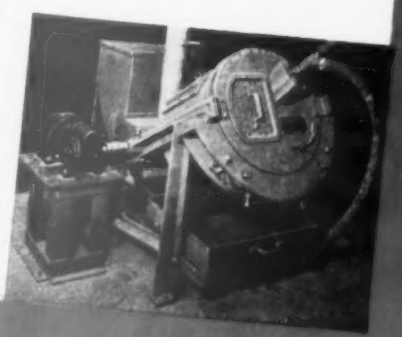
Exclusive wheel features for fast and economical cleaning.

SLY DUST FILTERS

1. More filter cloth—hence greater filtering capacity.
2. Filter bags under tension (patented) insure: (a) minimum resistance to air flow, and (b) complete dust removal.
3. Simpler shaker mechanism—less moving parts, less maintenance.
4. Bags more easily replaced.
5. Automatic control — any degree.

SLY BLAST MILLS

1. Handles quantities of castings, forgings, stampings, hardened steel parts.
2. Tilted barrel with rolling action.
3. Convex perforated bottom plate forms bottom of barrel.
4. Work is constantly turned bringing bottom pieces to top.
5. Stationary head of barrel has large door for loading.



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activities of foundry GROUPS

Philadelphia

PHILADELPHIA CHAPTER of the A.F.A. held its first meeting of the season Oct. 13, at the Engineers' Club. Over 100 members and guests answered the call of Chairman Bob Latham, and a very interesting program was presented by Chairman Bert Troy.

N. J. Dunbeck, vice president, Eastern Clay Products Inc., Eifort, O., discussed "How to Select a Bond Clay." John Howe Hall, metallurgist, General Steel Castings Corp., Eddystone, Pa., was technical chairman.

The speaker outlined the formation of various clays through natural processes and mentioned the various kinds of material that give strength or bond to foundry sand, including fire clays, bentonite and other binders, the most popular of which are western and southern bentonites. He also stressed the necessity of being cost-minded in the use of clays and binders, and emphatically pointed out the inherent qualities of western bentonite expanding and southern bentonite contracting in water solutions. The importance of choosing the right clay in application, as well as the need of periodically testing clays for strength and sintering points, additionally were emphasized. A discussion period followed.

At the directors' meeting interest was shown in John M. Robb's report of the Chicago meeting of chapter chairmen, the most urgent need being the training of future foundrymen.—*B. A. Miller.*

Central New York

FIRST meeting of the season for the Central New York Chapter of the A.F.A. was held Oct. 13 at the Onondaga Hotel, Syracuse, N. Y. About 80 members and guests were present. Speaker of the evening was R. G. McElwee, Vanadium Corp. of America, Detroit, who gave a very interesting talk on "Gray Iron."

Mr. McElwee pointed out that for years foundrymen have been concentrating on tensile strength as the major physical property of gray iron. This idea was so firmly entrenched that designers specified 30 iron, 40 iron, etc., meaning that 30 iron was iron which has a tensile strength of 30,000 pounds per square inch.

In recent years both the designer and the foundryman have recognized the other physical properties of cast iron that are more important than tensile strength in castings for particular uses. These properties are especially prominent in the so-called alloy or inoculated irons.

The speaker also pointed out that tests have proved that iron of the same carbon equivalent could be made using higher carbon and lower silicon than commonly used. This type iron will reduce casting difficulty in the foundry considerably.

Chairman Leon E. Hall, Syracuse Chilled Plow Co. Inc., presided.—*John Feola, reporter.*

Saginaw Valley

TWO hundred and twenty-five members and guests of the Saginaw Valley Group of the Detroit Chapter of the A.F.A. journeyed to Frankenmuth, Mich. to attend the second dinner meeting of the season, Nov. 2, at Fischer's Hotel.

The program consisted of the showing of an Army Signal Corps film "Baptism of Fire," followed by an excellent illustrated talk by Nathan Janco on "Centrifugal Casting Methods." Mr. Janco is owner of the Centrifugal Casting Machine Co., Tulsa, Okla., and also acts as consulting engineer on centrifugal casting to a number of large foundry organizations in the United States and Canada.

The speaker described the three general methods of centrifugal casting of metal; namely, the true centrifugal, the semi-centrifugal, and the centrifuge type. Numerous slides were shown of the general design of the molds and of the castings produced from them. It was explained that the speeds of rotation for various jobs can be estimated closely from prepared charts, or by computation, based on dimensions; and that once a job has been set up, if conditions are kept constant, a very uniform casting production can be obtained.

Mr. Janco stated that the advantages of the centrifugal casting method are improved soundness and high casting yield, but that this method is not to be taken as a "cure-all." The economics involved often makes it impossible for certain jobs to be made in other than the common static mold.

According to the speaker, the usual metals cast by centrifugal methods included iron, steel, and copper alloys, but that there had been some very successful work done with aluminum and magnesium.

In conclusion, a discussion of permanent metal mold materials was held, in which it was stated that alloy cast iron with a nodular graphite appeared economically best so far.

The next regular meeting of the group will be held Dec. 7, at Frankenmuth, with L. A. Danse, General Motors Corp., Detroit, discussing "Future of the Casting Industry."—*Joseph J. Clark, publicity committee.*

Northeastern Ohio

NATIONAL Officers' and Past Presidents' Night was combined with the annual November tribute to members of the armed forces, at the Nov. 9 meeting of the Northeastern Ohio Chapter of the A.F.A. Approximately 150 members and guests participated in the affair at the Cleveland Club, with President Russell F. Lincoln presiding.

Special guests were ten convalescing war veterans from nearby Crile General Hospital; Lieut. Dean Chatlain, a discharged veteran decorated for bravery in Tunisia; Fred J. Walls, International Nickel Co., Detroit, and vice president of the A.F.A.; William W. Maloney, business manager of the A.F.A.; and the past presidents of the chapter.

Speaking as an officer of the association, Mr. Walls urged foundrymen to take steps to interest young men in joining the industry and to offset the misleading publicity which has appeared in recent months concerning working conditions in the foundry. Mr. Maloney reviewed briefly the technical publications made available by the association lately, and praised the work of the hundreds of national committee members who have made possible this growing fund of practical foundry data. Lieutenant Chatlain gave a stirring account of the action in Tunisia leading up to his being wounded.

In his second speaker's role Mr. Walls discussed "Cupola Practice" with particular reference to carbon control and the factors affecting it. He listed the following as the principal items influencing carbon pickup: Cupola design, fuel, metal charge, air, flux, and cupola operation. Considering cupola design it was stated that the circumstances which could be expected to result in high carbon in the resulting iron include a high stack, large tuyeres, high tuyeres, and a large well, with position of the slag hole also a factor.

Fuel likewise contributes to high carbon when the coke is soft, when coke pieces are small for the same bed height, when the bed height is raised, or when the burning rate is increased. Chemistry of the coke also is a consideration, high volatile fuel developing increased carbon in the iron.

The metal charge affects carbon pickup from various standpoints, including the chemistry of the charge and condi-

(*Continued on page* 128)

BASKET!

In basketball—the country's most popular game—it's teamwork that wins. Profitable casting production takes teamwork, too—good men plus good methods and good materials.

MOGUL CEREAL BINDER . . . *saves binder costs;* reduces baking time and cleaning costs; increases oven capacity and core production . . . PRODUCES QUALITY CASTINGS.

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CORN PRODUCTS SALES CO.

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(*Continued from page* 126)

tion of the scrap. Higher carbon results from an increase in size of the total charge and in the proportion of pig iron used. The speaker stated that high carbon generally is associated with a fluid slag, low carbon with a sticky slag. Conditions tending to develop low carbon include high velocity of the blast and high humidity in the introduced air, while the colder the blast the lower will be the carbon pickup.

In discussing cupola operation, Mr. Walls recommended uniform tapping intervals and avoidance if possible of complete shutdowns. He also suggested close attention to obtaining uniformity in the weight, volume and surface area of charged materials.

Mr. Wall's informal presentation of his subject in which he invited discussion from the floor as the various points were considered, proved unusually effective.—*William G. Gude, publicity chairman.*

Cincinnati

OPENING meeting of the season for the Cincinnati Chapter of the A.F.A. was held Sept. 11 at the new headquarters of the Engineering Society of Cincinnati. This was Ladies Night, and a large crowd was present.

The program included a new technicolor motion picture called "The Formica Story" produced by the Formica Co., Cincinnati. This was a colorful story of plastics, their development, manufacture and uses. Wartime uses of plastics were shown, as well as probable uses in the peaceful years to follow the war.

Speaker of the evening was Arthur Reilly, news commentator of radio station WLW, whose subject was "When the Lights of the World Go On Again."

The meeting was followed by a social hour for the members, their wives and guests.—*Joseph Schumacher, secretary*

New England

A MEETING of the New England Foundrymen's Association, held Oct. 11 at the Engineers' Club, Boston, was devoted largely to the subject of personnel relations. Thomas C. Weiser, president, introduced the speaker, Edward E. Kuypers, director of personnel relations, First National Stores Inc., Boston, whose subject was: "Personnel Relations in the Coming Postwar Period."

Mr. Kuypers came to this country from Holland in 1914 and worked in textile mills until 1923. Since then he has been engaged in personnel work and has lectured extensively on industrial relations problems. His knowledge of labor management and personnel work proved of interest to everyone at the meeting as evidenced by the unusual number of questions at the close of his address.

His discussion traced the progress of trade unions from 1930, and the fact was stressed that unions were necessary to do for the employe what management should have done. Management has the right: To efficient work; to make a profit; to a loyal employe's service; to conduct its business on a sound, honest basis. In the same way labor has the right: To organize; to be represented by its own men; to impartial treatment; to good working conditions; to good supervision; to treatment as human beings; to receive the same consideration and recognition as a machine would be given. Unless we recognize the rights of labor, we cannot ask it to take responsibilities, the speaker added.

He stated that in the postwar period we will be required to recognize personnel training as a profession. The biggest problem in industry is that of handling grievances, but learning how to prevent grievances is better than learning how to handle them. Recognition of a job well done was stressed as important. Consultation and explanation of the reason for changes gives support by employes, but neglect in this respect gives loyalty to the union.—*Merton A. Hosmer, vice president.*

New Jersey

A GENERAL review of some of the more important problems confronting the local foundry industry was presented at a special dinner meeting, the first this fall, of the New Jersey Foundrymen's Association at the Elks Club, Irvington, N. J., Oct. 30.

John L. Carter, Newark, spoke on the labor situation, and H. L. Edinger, Barnett Foundry & Machine Co., Irvington, N. J., and chairman, Gray Iron Industry Advisory Committee to the Office of Price Administration, discussed results of the committee's conference in Cincinnati last month. Philip R. Nanduyne, Meeker Foundry Co., Newark, made a preliminary report with respect to the situation

(*Continued on page* 131)

LADIES NIGHT: *Cincinnati Chapter of A.F.A. includes social hour for members and wives at first fall meeting*

Quicker Baking in Ovens . . .

Lower Oven Temperature . . .

More Readily Collapsible Cores . . .

Much Lower in Price . . .

Low First Cost is But One of Several Savings

Certified *Rapidry* is a quality core oil from every standpoint; yet its extensive use and our modern production facilities make it possible to deliver it at a price substantially lower than that of conventional core oil.

Lower first cost, however, is but one of the advantages provided by *Rapidry* Core Oil. Many foundries would use it if it were among the highest priced core oils.

Rapidry mixes quickly, evenly and thoroughly with the sand, works smoothly in the core boxes and does not crust excessively when mixed with sand and left exposed during warm weather.

It bakes out quicker in the oven at usual temperatures, saving oven time; or it may be baked out at a lower temperature, saving fuel in either case. Provides readily collapsible cores; reducing shake-out time. Produces a minimum amount of smoke and gas, either in the core room or during pouring. Cores can be put in stock without danger of absorbing moisture.

There's a Certified *Rapidry* Core Oil for every foundry condition and type of sand. Sold under the condition that the quality must be as represented, run strictly uniform and give complete satisfaction or it may be returned for full credit. On this guarantee, we solicit a trial order from you. Just specify the grade and number of the core oil you use: whether it is golden or dark in color, the type and mesh of your sand, and a general description of your oven conditions.

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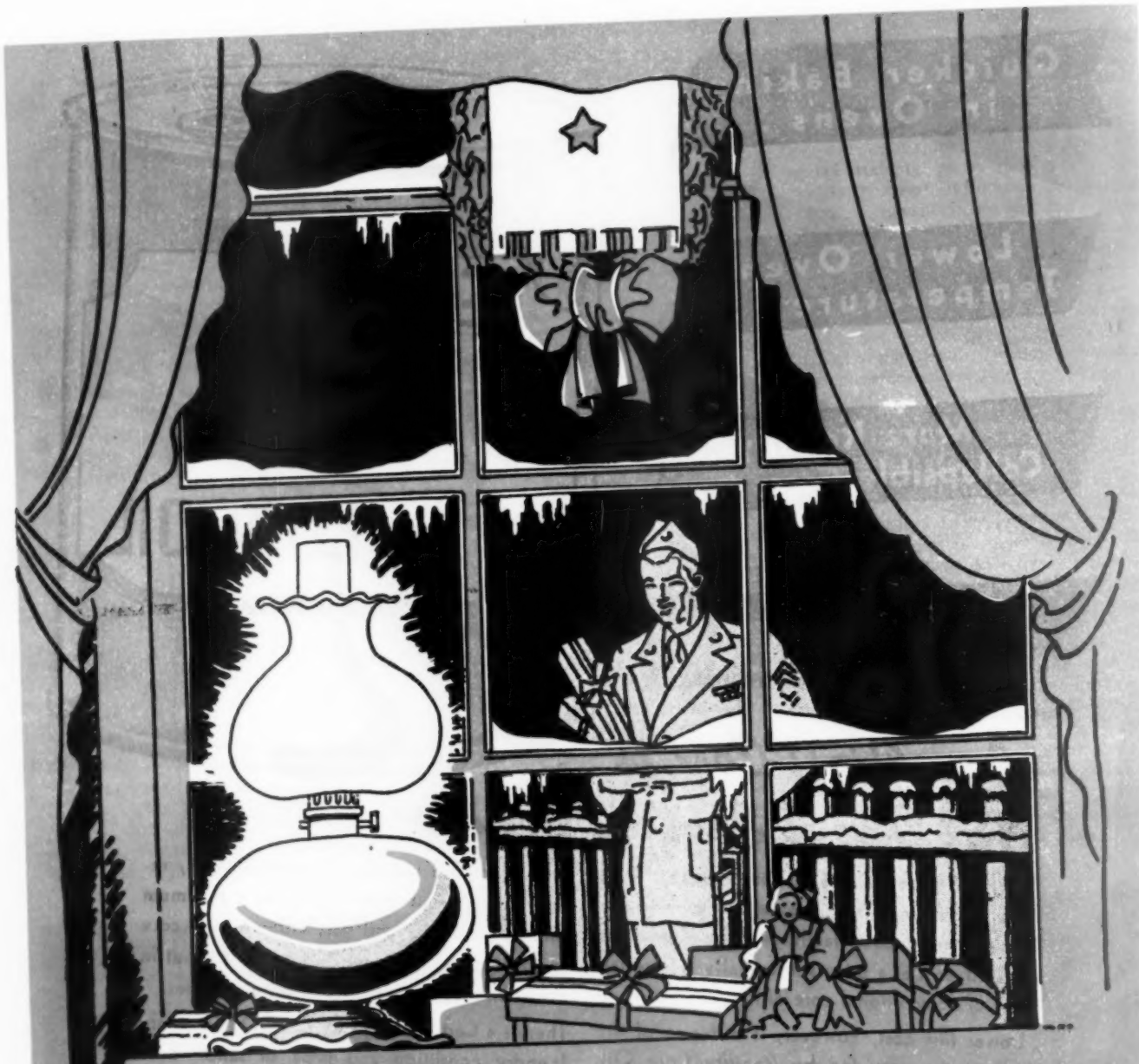

GREETINGS . . . . with a PRAYER

Greetings to all our friends this holiday season; with a prayer for speedy victory and the safe return of our loved ones.

GLOBE IRON COMPANY
THE PIONEERS OF SILVERY IRON

YOU CAN'T THINK OF SILVERY IRON WITHOUT THINKING OF GLOBE

GLOBE IRON CO.

JACKSON OHIO.

(*Continued from page* 128)

confronting the foundry industry when the state silicosis compensation law goes into effect Jan. 1.

Also there was a general discussion on several OPA problems, such as the return in increasing volume of work from old customers which is required to be taken on base period prices, the 4 per cent limitation on relief awards, the addition of overtime costs, etc.—*Ben K. Price.*

Quad-City

A MOTION PICTURE, "Men of Fire," followed the dinner at the Fort Armstrong Hotel, Rock Island, Ill., Oct. 16 which was attended by 71 members of the Quad-City Chapter of the A.F.A. The film illustrated the necessity of maintaining steady production in the foundry by elimination of absenteeism and job shifting.

Chairman R. E. Wilke introduced the speaker of the evening, John Perkins, assistant foundry superintendent, Ford Motor Co. of Canada, Windsor, Ont. In his discussion of "Centrifugal Castings" he described the dry sand, green sand, and die mold methods used in pouring several thousand tons of centrifugally cast steel parts monthly at the Ford foundry. Increase in yield, close tolerances possible, and increase in physical characteristics made possible by the centrifugal process, were emphasized by the speaker. In pouring steel castings the company has found it best to use the lowest possible pouring temperature, in this case 2830 degrees Fahr.

Mr. Perkins pointed out the tremendous increase in yield made possible by the centrifugal process. For instance, a 60-pound finished part which formerly required a 280-pound rough steel forging is now machined from a centrifugal casting weighing only 80 pounds. Close tolerances possible through the centrifugal process and increased physical characteristics are added advantages, according to the speaker. An unusually interesting discussion period concluded the meeting.—*H. L. Creps, secretary-treasurer.*

Chicago

FOR its December meeting, Chicago Chapter of the A.F.A. is promoting an "Old Timer's Night" to honor those who have served the casting industry in the Chicago area for 50 years or more. This is the first time the chapter has scheduled such an event, although other groups have done so with great success. The party, which will provide suitable recognition to the veterans and high-grade entertainment, and which will be of interest to "New Timers" and "Some Timers" as well, is to be held Dec. 5 at the Terrace Casino of the Morrison hotel.

Thus far, the chapter has succeeded in obtaining the names of approximately 75 who are qualified for the "Old Timer" distinction, and search is being made for additional candidates. Veterans are eligible regardless of whether they are active or retired, or members of nonmembers of the association.

The event is being arranged by a specially-appointed committee of which Charles P. Wright, vice president, American Brake Shoe Co., Chicago, is general chairman. Serving with him as co-chairmen are W. H. Parker, Continental Foundry & Machine Co., East Chicago, Ind., and T. J. Magnuson, salesman, J. S. McCormick Co., Chicago.

First of the chapter's series of four roundtable meetings for the 1944-45 season was conducted Nov. 6 at the Chicago Bar Association. Approximately 200 members and guests attended the dinner and three group sessions which followed.

Steel division devoted its attention to "Acid Refractories," with William C. Cress, research ceramist, Armour Research Foundation, Chicago, as speaker, and W. A. Linchester, Western Foundry Co., Chicago, as chairman.

Gray Iron and Malleable divisions joined interests to discuss "Patterns." E. B. Sabey, pattern shop foreman, Miehle Printing Press & Mfg. Co., Chicago, was speaker, and Martin Rintz, foundry superintendent, Continental Foundry & Machine Co., East Chicago, Ind., presided.

"Problems in Aluminum Castings" was the subject for the Nonferrous division. Principal speaker was F. D. Chew, aluminum technician, Federated Metals Divi-

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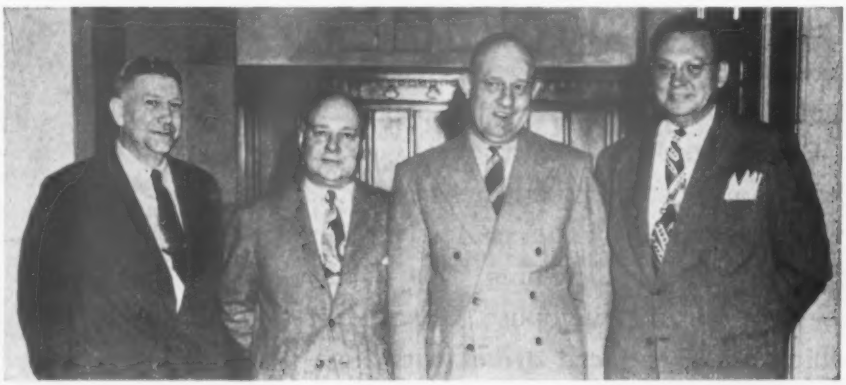

SOUTHERN CALIFORNIA: *Views at first fall meeting of the A.F.A. chapter at Los Angeles include at right, present and past presidents James E. Eppley (1940-41), Walter F. Haggman (1943-44), B. G. Emmett (1941-42) and W. D. Bailey Jr. (1944-45). Below at right is Leonard Hoffsteter, Brumley-Donaldson Co., principal speaker of the evening. Shown at speakers' table, left to right, are: George Emmett, Jim Eppley, Jack Crawford, Bob Haley, Hal Russill, Bill Bailey, Len Hoffsteter, A. K. Barr, Bob Gregg, James Barr, Ralph Wertz, L. M. Nash and Dick Hughes (standing)*

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80% of all motor-driven machines, 1 hp and above, must operate at slower speeds than the motors which drive them.

Consequently, some type of speed reduction must be inserted between the motor and the driven machine. The best method of accomplishing this is by the use of Westinghouse Gearmotors which are slow-speed drives with high-speed motor efficiencies.

The product of more than 50 years of gearing experience, these Westinghouse units are designed, built, tested and guaranteed as single units.

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Type C — A double-reduction unit for standard ratios from 7.6:1 to 25.7:1, inclusive.

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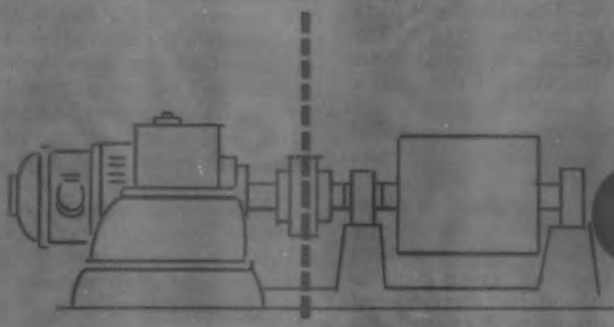
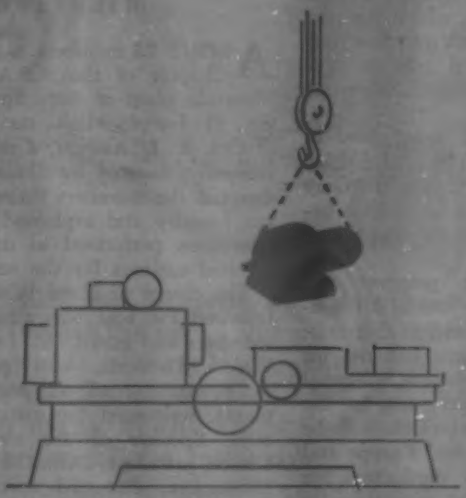


1

COMPACTNESS . . . it takes less space than any other form of parallel shaft speed reduction . . . makes belts, belt guards, pulleys, overhead line shafts *unnecessary*.



2

LONG LIFE—MINIMUM MAINTENANCE. A gearmotor has no belts, chains or ropes to replace . . . no multiple-parts to realign . . . no bearings to oil . . . no gears to grease. Probable maintenance consists of a twice-a-year oil change.

3

EASE OF INSTALLATION. By combining the prime mover and speed reducer in a single unit, the gearmotor is installed quickly and inexpensively.

4

HIGH EFFICIENCY. Only 2% power loss is involved in each stage of reduction . . . a single-reduction unit is 98% efficient; a double-reduction unit is 96% efficient. Compare this with the efficiency of other types of slow-speed drives.

5

LOW OVER-ALL COST. The initial installed cost of a gearmotor is usually lower than any other type of speed reduction. On the basis of maintenance and power losses, a gearmotor is *always* most economical.

6

SAFETY FOR WORKERS. A gearmotor has no exposed moving parts . . . no belts, pulleys, chains or ropes to endanger workers. It is totally-enclosed in a streamlined housing.

Gearmotors

(*Continued from page* 131)

sion, American Smelting & Refining Co., Detroit. L. G. Jessup, foundry technician, of the same company, Chicago, was chairman.

Chapter President Arthur S. Klopf, manager of the iron division, Firegan Sales Co., Chicago, and Vice President J. C. Gore, Chicago manager, Werner G. Smith Co., presided jointly during general portions of the meeting.—*Erle F. Ross*

Southern California

SOUTHERN California Chapter of the A.F.A. met in its second dinner meeting of the 1944-45 season at the Clark Hotel, Los Angeles, Oct. 27. More than 100 members and guests were present. Following the social hour and dinner, W. D. Bailey Jr., chapter president, introduced Mr. Marvin of the Pasadena School System and Instructor Todd of the Pasadena Junior College. Both of these educators discussed the problems involved in the course in foundry training now being given in the Pasadena Junior College night school.

The speaker of the evening, A. J. Edgar, technical advisor, Gray Iron Founders' Society, was then introduced. In his address on "Foundry Technology and Profits," Mr. Edgar paid a compliment to the great development of the foundry industry on the West coast in war years, and stated that in his opinion, the industry was due to expand much further. Reviewing the war record of the gray iron foundry industry he declared that originally the use of gray iron had been slighted due to lack of knowledge of its importance by responsible government officials. Among other topics Mr. Edgar discussed the use of lighter metals in postwar industry, and called for improvements in business methods and operating practice in the gray iron foundry industry to meet possible competition.—*Luther Whiteman.*

Pittsburgh

QUESTIONS and answers on foundry practice, metallurgy, and a dozen other subjects featured the October meeting of the Pittsburgh Foundrymens Association. Under the guiding hand of M. J. Kellner, Walworth Co., Greensburg, Pa., who acted as master of ceremonies and chief interrogator, the four technical committees of the association answered queries on gray iron, steel, malleable and nonferrous foundry subjects.

Chief subjects of interest included control of carbon in the cupola in making malleable iron, hardenability control and measurement on steel castings, control of porosity in brass and bronze castings and wear resistance properties of gray iron.

Henry P. Spilker, chairman of the executive committee, attended his first meeting following a six-months' illness, and expressed his thanks to the membership for their many remembrances during his long siege. About 100 foundrymen and their guests were present for the session.—*R. L. Hartford.*

Northern California

NORTHERN California Chapter of the A.F.A. held its annual golf party and dinner at Orinda Country Club, Friday afternoon, Oct. 20, and in spite of the weather, 30 golfers claimed they had a good time on the course.

The locker room annex was a crowded gathering place during the late afternoon, preceding a good dinner, after which there was one continuous round of pleasure. Pete Valentine, accompanied by Ernie Carr and Jimmy Muir, furnished musical inspiration for group singing. George Bloxham and his entertainment committee had previously discovered that several of our members possessed considerable talent, which added to the evening's enjoyment. Prizes awarded during the evening consisted only of War Bonds and Stamps.—*George L. Kennard, secretary.*

A market for castings "unequalled in peacetime" was predicted by A. J. Edgar, Washington, technical adviser to the Gray Iron Founders' Society, in an address before the Northern California chapter on Nov. 3.

Predicting a bright prospect for foundries throughout the nation, Mr. Edgar said: "In the tremendous pent-up, steadily expanding domestic demand for household, farm, transportation, industrial and construction equipment and in the great tonnages of goods which will be required to put war-wrecked Europe and the Far East back into production for peace are castings market potentials far greater than the industry has had in prospect in any decade in its history."

Pointing to estimates of an immediate postwar demand for 6,000,000 automobiles annually, he said "this alone will mean orders placed with gray iron foundries of nearly 1,600,000 tons of castings annually."

Ferrous foundry capacity of the United States has never been definitely determined, Mr. Edgar told the gathering, but he indicated that it probably exceeds 40,000,000 tons annually. At that level it is fully adequate for all postwar needs, he said.

"According to D. J. Reese, chief of the WPB Manufacture and Foundry Products Section," Mr. Edgar continued, "gray iron melting capacity alone is nearly 30,000,000 tons a year. Last year, Mr. Reese estimates, the furnaces of gray iron, malleable and steel foundries delivered close to 23,000,000 tons of metal for battlefront and essential home front uses."

Terming the gray iron industry as "the colossus of the industries grouped as foundries and forge shops," Mr. Edgar said it is the nation's second largest producer of engineering materials and is in a position to make overnight reconversion to peacetime output. California's gray iron foundries, operating only three hours a day, six days a week, nevertheless are capable of immediately producing a million tons of metal annually for peacetime use, he said.

Mr. Edgar anticipates greater competition for the castings market from other manufacturing processes after the war, but he does not believe this competition will make serious inroads. "Engineering field awareness of the fact that the castings process is the shortest, most economical manufacturing route between raw materials and finished parts will continue to bulwark the foundries," he pointed out.

However, he warned, the foundry industry must continue to engineer its materials to still higher levels of quality, give increasing attention to cost controls, introduce further production economies and market more aggressively if it is to make the most of its postwar opportunities.—*Robert Bottorff.*

Michiana

ABOUT 75 members of the Michiana Chapter of the A.F.A. visited the Riverside plant of Auto Specialties Mfg. Co., St. Joseph, Mich., on the afternoon of Oct. 3. L. Krieger, a member of the company, assisted by about ten guards, directed the members through the modern foundry and explained the different operations performed in the production of steel castings for the armed services.

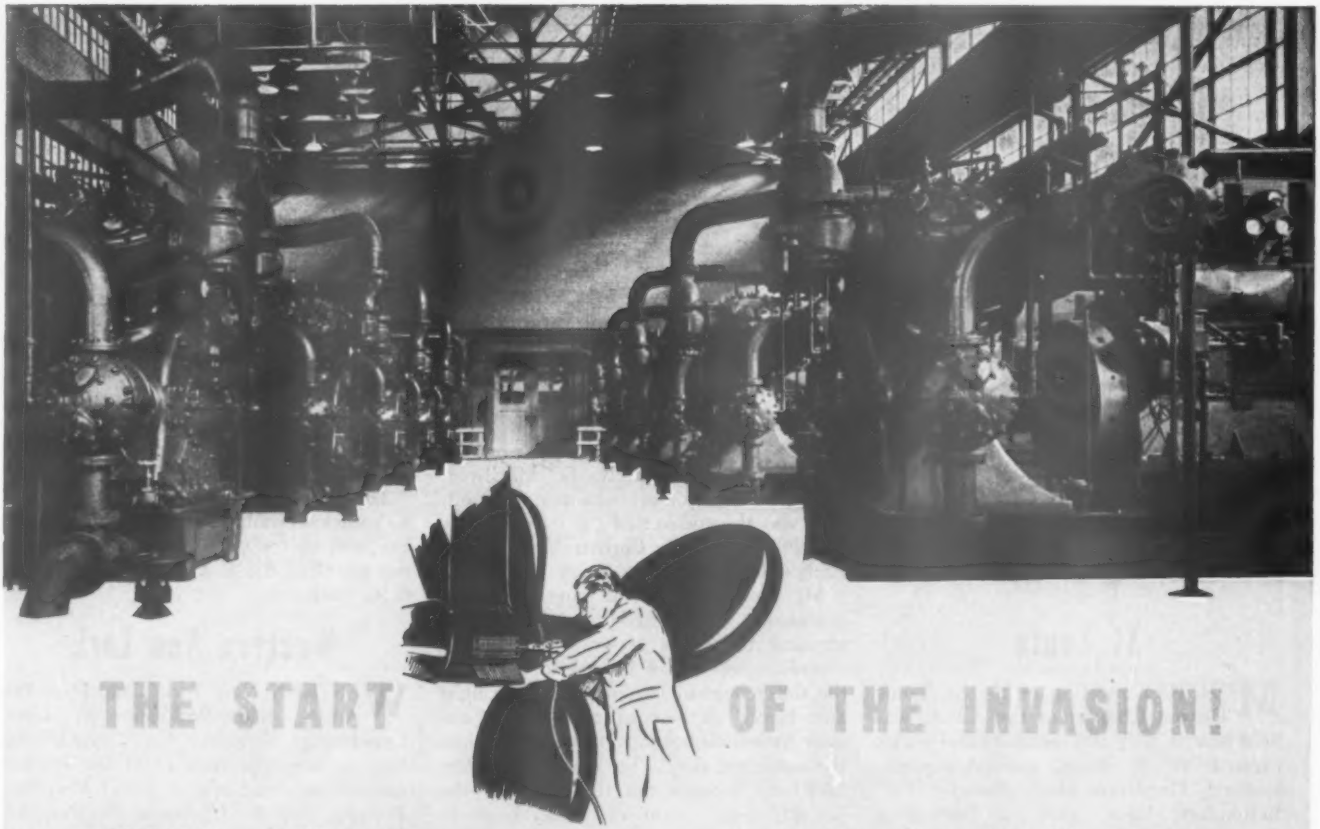
The dinner at Hotel Whitcomb which followed the tour was attended by 168 members and guests. St. Joseph's mayor, Waldo Tiscornia, vice president and plant manager of all Auto Specialties plants, welcomed the association to the city. Speaker of the evening, J. A. Gitzen, president, Delta Oil Products Co., Milwaukee, discussed cores, mixing of sand, baking, and the evils of too much core oil. Music by the Merrymen's Glee Club of 30 male voices provided entertainment. Chairman Vincent Bruce presided.—*John J. McAntee.*

Canton

A QUESTION box made of mahogany and topped by a brass question mark, was accepted by Chairman Karl F. Schmidt, United Engineering & Foundry Co., from the Pitcairn Co., Barberton, O., as a gift to the Canton District Chapter of the A.F.A. at a dinner meeting, Oct. 26, attended by 62 members and guests.

"The Economics of the Carbon-Silicon Balance" was discussed by R. G. McElwee, manager, Foundry Division, Vanadium Corp. of America, and chairman of Detroit Chapter, A.F.A. Castings of high carbon content can possess high tensile strength by proper balance of silicon, said Mr. McElwee. Carbon-silicon ratios present a complex problem when tensile strength and hardness qualities are specified and must be produced in castings possessing radically different design, cooling rates and section thickness. The outstanding merit of iron of high carbon lies in the very low shrinkage produced. Ladle additions of ferroalloys in proper

(*Continued on page* 136)



THE START OF THE INVASION!

THESE ten Sullivan air compressors furnish the air power—15,000 cubic feet of it every minute—that operates the thousands of tools used in building many of the ships that form the life line of the invasion.

Chipping hammers, sand rammers, air hoists, sand blast machines, grinders, spray guns and the countless other tools that are used in this huge plant are powered entirely by this battery of heavy-duty, continuous-service compressors.

Sullivan WN-114's were chosen for this important war job for a number of reasons: They were easily and economically installed (all Series 100 compressors are shipped completely assembled). They were ideally suited for Diesel drive (Series 100 compressors operate efficiently with any type of drive). They require little floor space (compact design made this saving possible). They carried an endorsement from industry for their lower maintenance costs (since 1937, when the first Series 100 was built, these modern compressors have been used in every type of industry with unqualified success).

The efficient Sullivan Series 100 air compressor has been an important factor in the creation of wartime production records. It is also playing an equally important role in the post-war plans of far-sighted executives. Sullivan Machinery Company, Michigan City, Indiana. IN CANADA: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

SULLIVAN

AIR COMPRESSORS FROM ¼ TO 3,000 H.P.

ARMY E NAVY

OFFICES—Seattle • Boston • New York • Chicago • Portland • Pittsburgh • St. Louis • Detroit • San Francisco • Birmingham • Knoxville • Huntington • Los Angeles • Duluth • El Paso • Butte • Salt Lake City • Scranton • Denver • Dallas.

PRODUCTS—Stationary and Portable Air Compressors from ¼ to 3000 H. P. • Pneumatic Caulking Grips • Foundation Breakers • Portable Hoists • Rock Drills.

(*Continued from page* 134)

balance and judiciously used enter the economic picture by elimination of faulty castings and rejects and, because of lower shrinkage, by reduction of the number of risers necessary. This makes it possible to produce a larger number of castings per ton of iron.

The coffee talk, "The Returning Veteran," ably presented by Lt. Richard E. Van Ness, assistant chief, Veterans Personnel Division, Ohio State Selective Service Headquarters, proved of considerable interest. A question-and-answer period followed Lt. Van Ness' explanation of this broad subject.

Glenn Price, a former "Cantonite" and recently arrived from his post in India, where he is superintendent of operations at the Tata Iron & Steel Division of the Tin Plate Co. of India, made some informal comments on India's present role in the foundry industry and her future possibilities.—*Nils E. Moore, reporter.*

St. Louis

MONTHLY meeting of the St. Louis District Chapter of the A.F.A. was held Nov. 9, with 106 members and guests present. W. E. Jones, general superintendent, Ordnance Steel Foundry Co., Bettendorf, Iowa, gave an interesting paper, "Atmospheric and Washburn Risers," accompanying his talk with slides illustrating actual experiences in the company plant. Mr. Jones stated that by use of these materials it has been possible to effect real savings in the grinding and cutting off of risers. A discussion period followed the talk.—*Charles E. Rothweiler, secretary-treasurer.*

Birmingham

BIRMINGHAM District Chapter of the A.F.A. was off to an auspicious start for the new year on Oct. 30 when 84 members turned out for the monthly dinner and meeting at the Tutwiler Hotel.

Dr. James T. MacKenzie, program chairman, introduced R. G. McElwee, Vanadium Corp. of America, Detroit, who was the speaker of the evening. His subject was "High Carbon Versus Low Carbon Iron."

Mr. McElwee dealt at length with the inoculants being used to improve the physical properties of gray iron. These inoculants also have helped to eliminate the differences in hardness between light and heavy sections of castings. In answer to many questions of how and when the inoculant should be administered Mr. McElwee brought out the fact that the benefits of the inoculant usually begin to be lost 10 minutes after being added and seem to cease to exist in the iron after 25 minutes has elapsed. Therefore the inoculants should be administered as near the final pouring stage as possible. He also emphasized the fact that inoculation can be made effective in high carbon as well as low carbon iron.

Fred K. Brown, secretary-treasurer, gave a detailed financial report showing the chapter to be in excellent financial condition. Mr. Brown then introduced 34 new members of the chapter, and Joe T. Gilbert, chairman, praised the membership committee for its fine showing in securing new members. The committee is composed of A. S. Holberg, chairman, George F. Vann, Frank Kopp, Dave Booker, Paul Sullivan and Morris L. Hawkins.

Dr. MacKenzie announced that James S. Vanick, consultant, International Nickel Co., will be the speaker at the next meeting on Dec. 8.—*J. P. McClendon, publicity chairman.*

Western New York

WESTERN New York Chapter of the A.F.A. had Waldeck W. Levi, Lynchburg Foundry Co., Lynchburg, Va., as principal speaker at the regular monthly meeting held at Hotel Touraine, Buffalo, Nov. 3. Chairman Reinhold D. Loesch presided at the meeting, which had an attendance of about 125.

Leslie C. Thellemann, chairman of the membership committee, introduced new members present and announced that the chapter membership now totals 244. Chairman Loesch announced that two members, James L. Yates, Worthington Pump & Machinery Corp., and Thomas S. Hemenway, Metal & Alloy Specialties Co. Inc., have been appointed to the advisory board of the Engineering School of University of Buffalo.

Frank E. Bates, immediate past chairman of the chapter, was called on to present past-chairman pins to other former heads of the group. Past chairmen include: T. H. Burke, Otis Elevator Co., 1937-38; M. W. Pohlman, Pohlman Foundry Co. Inc., 1938-39; W. J. Corbett (deceased) 1939-40; J. C. McCallum, McCallum-Hatch Bronze Co. Inc., 1940-41; R. K. Glass, Republic Steel Corp., 1941-42; R. T. Rycroft, Jewell Alloy & Malleable Co., 1942-43; F. E. Bates, Worthington Pump & Machinery Corp., 1943-44.

Technical Chairman James L. Yates introduced Mr. Levi, who substituted for Max Kuniansky, originally scheduled speaker, in discussing "Today's Cupola Operation and Scrap." Mr. Levi first described the various products manufactured by his company, including centrifugally cast pipe, castings for the chemical industry and wartime jobbing work. The company also makes a patented metal called Lyncast, which is processed to replace low phos pig iron, because the latter is considered to have a high delivered cost in Virginia.

Control of the metal composition starts with the cupola bottom, which is rammed

(*Continued on page* 143)

HONOR PAST CHAIRMEN: *Western New York Chapter of A.F.A. paid tribute to its former chairmen at its Nov. 3 meeting with the presentation of specially designed pins. Shown above is the chapter's immediate past chairman, Frank E. Bates, Worthington Pump & Machinery Corp. as he made the presentations to (left to right) Theodore H. Burke, Otis Elevator Co.; John C. McCallum, McCallum-Hatch Bronze Co. Inc.; Robert K. Glass, Republic Steel Corp.; Ralph T. Rycroft, Jewell Alloy & Malleable Co. Past Chairman Martin W. Pohlman, Pohlman Foundry Co. Inc., was unable to be present. Below are shown some of the members and guests present at the meeting. Photos courtesy Western New York Chapter of A.F.A.*

PHILCO

Again in the News

THE BATTERY THAT GIVES 30% LONGER LIFE

—Another Philco "First"

Revolutionary new

PHILCO "THIRTY"

WITH 30% LONGER LIFE RADICALLY CUTS MOTIVE POWER BATTERY COST!

★ ***Reduces depreciation and maintenance***
★ ***Gets more work done***
★ ***Packs a terrific wallop***

What every materials handling man wants in a storage battery is **packed** into this amazing new Philco "Thirty."

In high capacity, it is **tops** in the field—assuring the maximum tonnage every shift. Even after long hours of heavy work, it has the reserve power to climb ramps and grades, and complete the shift in *high*.

But the feature which sets the new Philco "Thirty" entirely apart from all other batteries you have known, used, or even heard of before—is its phenomenal long life. **30% longer life**—often more—has been demonstrated time after time in exhaustive field tests.

Here, then, is more than just a new and better battery. Here is a new standard of battery performance—*and* a new yardstick by which all battery values must now be judged.

That's why it will pay you to get posted on this great new Philco Battery which is now available in certain types and limited quantities. Full information gladly will be sent on request.

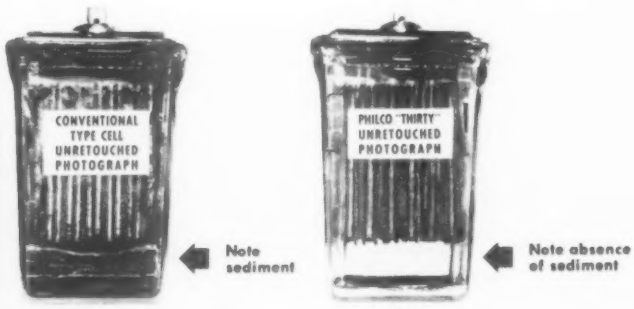
REVOLUTIONARY NEW PRINCIPLE OF PHILCO FABRICATED INSULATION*

Only PHILCO "THIRTY" has it!

Here is a brand-new construction principle *and* an ultra-modern application of a proven insulating material. Both the results of Philco pioneering! This material is fabricated glass tape wrapped around the positive plates in two layers, first vertically and then horizontally. Even a single layer of this glass tape insulation has been found to have better retentive power in holding the active material in the plate, than the standard glass mat! And—of course, the plates of the Philco "Thirty" are further protected and insulated with the time tested Philco slotted rubber retainer and rubber separator.

**Patent applied for*

YOU GET IT FIRST WITH PHILCO



PROVED BY YEARS OF FIELD AND LABORATORY TESTS

As proved in scores of service tests, these unretouched photographs show what happens when a Philco "Thirty" cell (A) and a conventional type cell (B) are tested side by side in motive power cycle service, charged and discharged in series in the same circuit. Glass jars were used here only to permit observation. Note almost total absence of sediment in the Philco "Thirty", while the sediment space of cell B is filled. Cell B has delivered its normal life expectancy and is worn out—while the Philco "Thirty" still delivers over 100% of rated capacity, with a long margin of serviceable life still to go.

THE CLIMAX OF 50 YEARS OF LEADERSHIP IN BATTERY RESEARCH AND ENGINEERING

The procession of Philco "Firsts", covering the whole field of motive power and stationary batteries, has set the pace in modern battery design. Check the developments, which have contributed most to today's higher capacities, increased efficiency, longer life, and lower cost—the record shows *you get it first with Philco.*

PHILCO VITRABLOC

A development for telephone, control and standby service, that materially increases battery room capacities.

PHILCO FLOTÉ

The battery that exerted a major influence on the wider use of full float service, by eliminating low cells. More efficient . . . more economical to maintain.

PHILCO HIGH CAPACITY CELLS

Through modern plate design, Philco showed the way to increased capacity without increase in over-all battery dimensions. A tremendous advantage in many motive power operations.

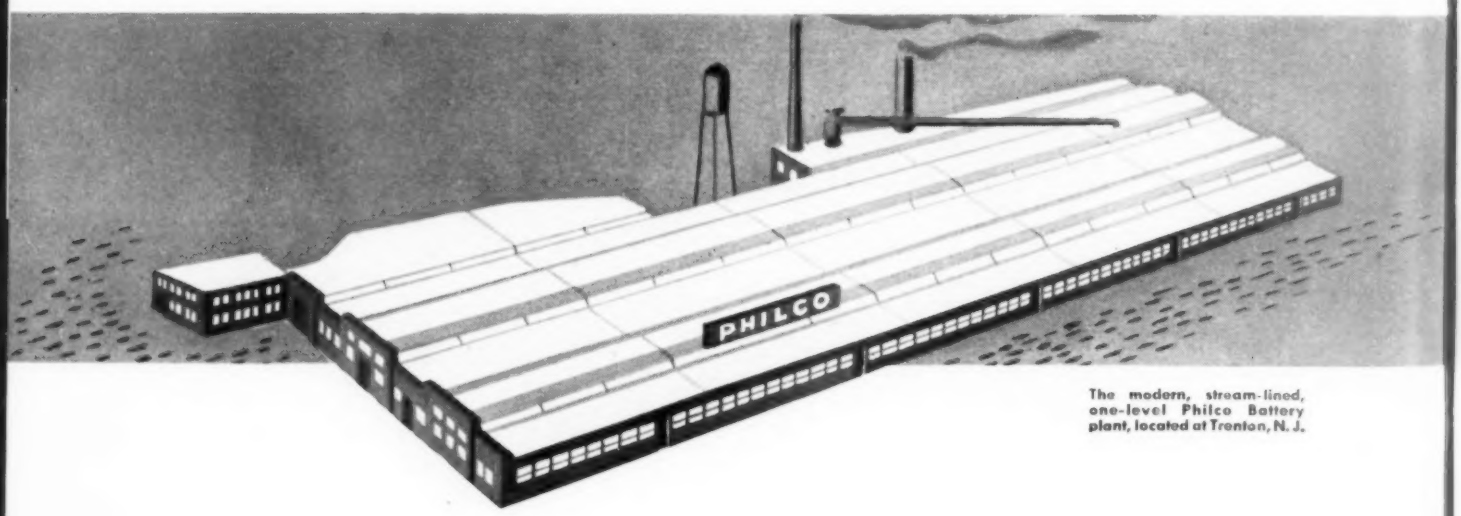
PHILCO

BUILT FOR MODERN DEMANDS BY THE LEADER IN MODERN BATTERY ENGINEERING

As described in the foregoing pages, Philco is ready, today, with the advanced battery performance and long-life economy you'll need in your post-war operations. With model manufacturing facilities, Philco is ready to produce these superior batteries in greater volume than ever before.

In the complete Philco line are modern storage batteries for all industrial applications—industrial trucks, mine locomotives and shuttle cars, diesel starting, railroad car lighting and air conditioning, control and power, telephone service and signal systems.

On your next purchase of batteries specify a modern Philco.



The modern, stream-lined, one-level Philco Battery plant, located at Trenton, N. J.

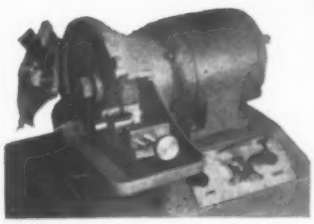
PHILCO CORPORATION

STORAGE BATTERY DIVISION • TRENTON 7, NEW JERSEY

For 50 Years a Leader in Industrial Storage Battery Development

Buehler

No. 1010



Splash guard opened showing jet pipe for coolant; a companion jet is on the opposite side of the wheel.

Complete view of cabinet showing storage bin for extra wheels and tools.

NEW 1 H. P. Cut-Off Machine

A laboratory size cutter with ample power for fast cutting of samples up to 1" in diameter.

This cut-off machine is built with the usual Buehler emphasis on precision in both the construction of the machine itself and the work it performs. The controls are arranged for the utmost convenience of the operator—a feature that contributes to speed and accuracy in cutting samples.

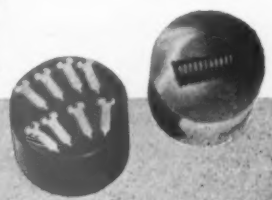
The cutting wheel mounted directly on the ball bearing motor shaft is free from side play or vibration and is cooled by a stream of coolant directed on both sides of the wheel under the guard.

The cutting is done on the front of the wheel by using the long lever handle to raise the clamp base holding the sample to contact the wheel. This mechanism is balanced so that pressure against the cutting wheel is under perfect control at all times by the operator. A metal splash guard, removed in the illustration, furnishes protection from spray.

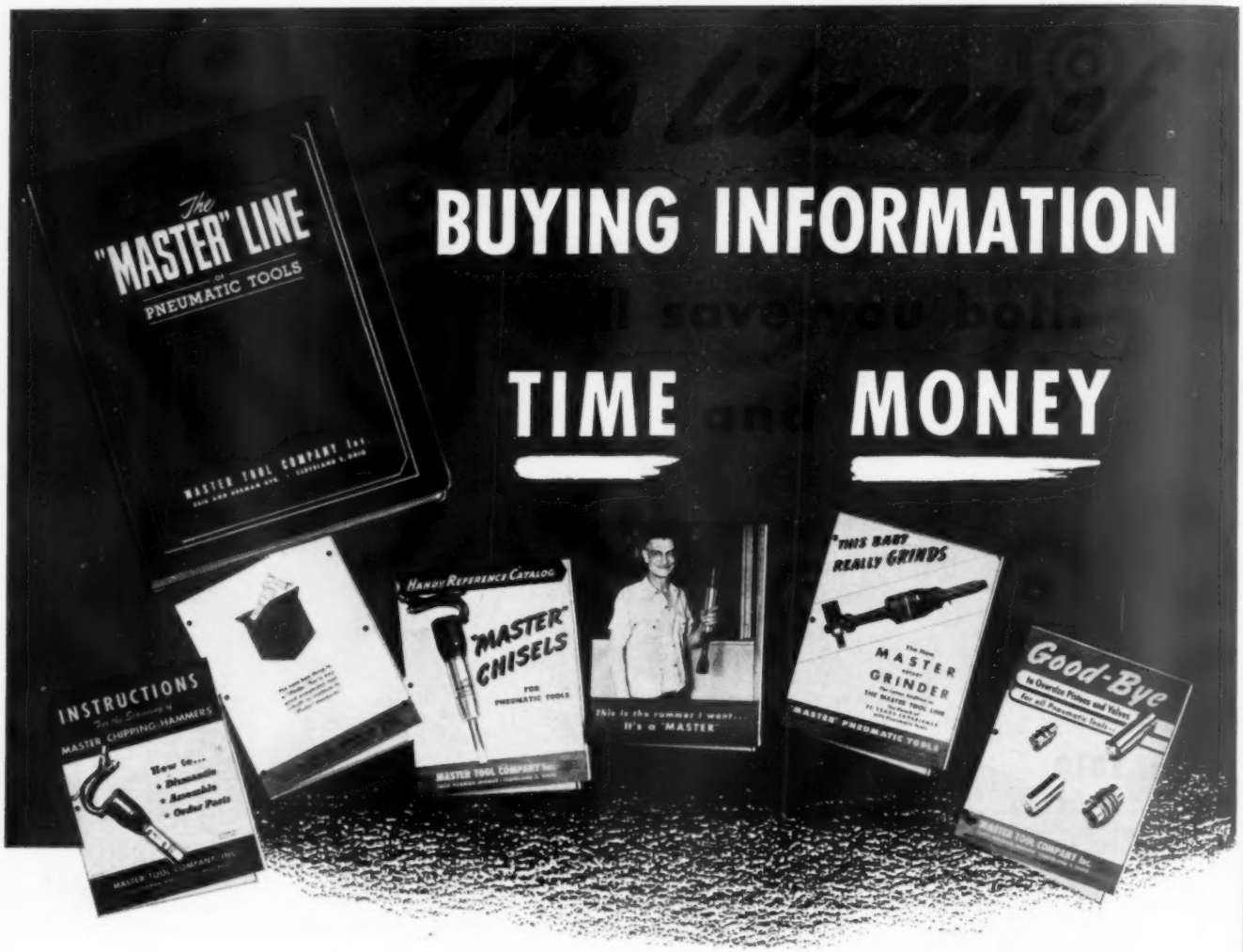
Overall dimensions are 24" x 28" x 50". Shipping weight, 575 lbs.

THE BUEHLER LINE OF SPECIMEN PREPARATION EQUIPMENT INCLUDES . . .
CUT-OFF MACHINES • SPECIMEN MOUNT PRESSES • POWER GRINDERS
EMERY PAPER GRINDERS • HAND GRINDERS • BELT SURFACERS
POLISHERS • POLISHING CLOTHS • POLISHING ABRASIVES

Buehler Ltd.
A PARTNERSHIP



METALLURGICAL APPARATUS
165 WEST WACKER DRIVE, CHICAGO 1, ILLINOIS



The "Master Line" catalog of Pneumatic Tools doesn't take up a 5 foot shelf —but it does contain all the pertinent information you need when you are ordering chipping hammers, floor, bench and core rammers, grinders, chisels or replacement parts.

In addition to complete buying information it tells why and how "MASTER" uses hard chrome plate to give up to three times normal life—to save expensive air—to help increase production by keeping more tools on the line.

If you are one of the many users of "MASTER" Pneumatic Tools it will acquaint you with the correct servicing procedure on these precision-made tools and facilitate your ordering of tools and parts. If you are a prospective user it may help convert you to the use of hard chrome plated tools, a step that will save you time and money.

Write today for your copy of the
"MASTER" CATALOG of Pneumatic Tools

"MASTER" PNEUMATIC TOOLS
MADE BY
MASTER TOOL COMPANY, INC.
5605 Herman Avenue • • Cleveland 2, Ohio
• SALES AND SERVICE FROM COAST TO COAST •

(*Continued from page* 136)

uniformly each day so that the amount of iron held by the well remains constant. Small charges are used in the 72-inch cupola to obtain uniform analysis in the teapot ladles where the metal is desulphurized. Accuracy in weighing the different metals making up the cupola charge was emphasized by the speaker as important.

Mr. Levi described in detail the Kathabar system in front of the blower for removal of moisture from the cupola blast. Two of the cupolas at the Radford plant are balanced blast, while the other two are conventional type. All iron is inoculated when being poured from the teapot ladles to the pouring ladles, using ferrosilicon or zirconium-silicon alloy. Chill tests are run on each ladle of iron, and the laboratory makes a complete analysis of the metal each hour. Phosphorus is determined once for each type of iron, while carbon is determined and test bars are made on every ladle of Lyncast or other special irons.

An interesting discussion period followed Mr. Levi's presentation.—*J. Ralph Turner, secretary.*

Reading

REGULAR meeting of the Reading Foundrymen's Association, held at the Berkshire Hotel, Reading, Pa., Oct. 17, had an attendance of 80 members and guests. Herman P. Good, presided.

Speaker of the evening was John L. Carter, cost consultant, Gray Iron Founders' Society. Mr. Carter stated that a low profit level has been a serious handicap to the gray iron foundry industry and urged adoption of sound accounting systems in meeting postwar competition.

During the period 1936 to 1939 the average profit of the industry was 4 per cent, Mr. Carter said, with 25 per cent of the foundries in the country losing money. Only 25 per cent of the firms had sound accounting systems, and if the number had been 75 per cent of the total, the annual profit of the industry would have been approximately $30,000,000 greater, he added.

Mr. Carter pointed out that the variance in methods of arriving at costs had caused some foundries to bid too high on cheap work and too low on expensive work. "As the average business cycle is 7 years," Mr. Carter said, "the basing of foundry costs upon normal volume, the adoption of a system suitable for the type of work undertaken and the elimination of guesswork from cost calculations will mean the difference between profit and loss."

Officers nominated by the association for election at the November meeting were: President, Charles C. Mundell, Fairmount Foundry Inc., Hamburg, Pa.; vice president, Robert P. Fritch, Union Bronze Co., Reading; treasurer, George W. Shomo, Confer-Smith & Co., Hamburg, Pa. Members appointed to executive committee were: E. J. Snell, B. W. Edris, William M. Davies, Richard Henderson, Daniel G. Burkert, William Hoffman, Edward K. Mark and Hermann P. Good, retiring president of the association.—*H. C. Cummings, secretary.*

Wisconsin

OCT. 13 meeting of the Wisconsin Chapter of the A.F.A., held at the Schroeder Hotel, Milwaukee, again was devoted to sectional discussions by six different groups, with good attendance and active interest marking the various talks.

"Cast Iron Specifications" was discussed by Tom E. Barlow, Battelle Memorial Institute, before the Gray Iron section, of which J. V. Olle, Motor Castings Co., was chairman. Mr. Barlow pointed out that there are insufficient specifications to cover the large family of metals constituting gray iron; for example, iron used in a lathe bed could never be used in making piston rings.

In general, there are three kinds of specifications: Society or association, government, and company. Company specifications have included gray cast iron, semisteel, nickel cast iron, nickel-chromium cast iron, alloyed cast iron, trade names, combined chemical and physical specifications, and wear, growth and heat resisting iron. However, these have little concrete meaning to the foundryman.

Mr. Barlow said that postwar developments in application of specifications may see a tendency toward use of microstructure. One foundry is using this test alone on all lathe beds it produces. A possible substitute for chemical analysis in specifications may be the carbon-equivalent. A good specification for gray iron, he stated, should include: 1. A.S.T.M. classes for the basic specification. 2. Section size. Test bars should be from a certain size section, and the engineer should be supplied figures for interpreting results at other sections. 3. Symbols should be used to indicate changes in base iron, such as the additions of alloys. 4. Symbols for inoculants used. 5. Symbols to show heat treatment desired. The speaker also recommended that the A.F.A. organize a special committee to write some standard specifications for cast iron.

The Malleable section, under the chairmanship of Stephen Pohl, Federal Malleable Co., heard an informative discussion on "Synthetic Bonded Sand Versus Natural Bonded Sand." E. W. Clarr, foundry engineer, Eastern Clay Products Inc., Eifort, O., spoke on the advantages of synthetic sand, and George Anselman, foundry engineer, Goebig Mineral Supply Co., described the merits of natural molding sand. Following their presentations an open discussion brought forth many questions and comments from the floor.

"Methods of Time and Motion Study in Foundries" was the subject discussed by the Steel section, with Jeff. Alan Westover, Dyer Engineers, Inc., the speaker. One core operation was broken down into its various components, and a detailed description was presented of how a curve is developed to be used as an element in a standards set-up. It was emphasized that these standards are established in time units, rather than in dollars and cents, so that once they are set up no changes are necessary until a change in method is used.

The Pattern section meeting was devoted to a general discussion of pattern equipment, with A. F. Pfeiffer, Allis-Chalmers Mfg. Co., serving as chairman. A. M. Fischer, Chas. Jurack Co., discussed the application of vibrators built into the pattern. He recommended that the pattern be made with exceptionally strong heads, which must be secured rigidly with steel plates for mounting the vibrators. Advantages of vibrator use include reduction in pattern repairs, elimination of mold patching, and production of a mold that is true to the pattern.

Paul E. Riedel, Production Pattern Co., explained the construction of a pattern for a small, air-cooled cylinder. A. Weberg, Belle City Malleable Iron Co., described an interesting method of increasing a riser on a pattern. In the general discussion on use of metal match plates it was agreed that for new patterns the gates and risers should be loose until sample castings have been approved. Mr. Pfeiffer recommended that study be given old patterns when they are sent to the foundry, in order that they may be improved if possible. A slide was shown to demonstrate how the molding of a pattern was changed to reduce the risers and effect a saving in metal, cleaning and machining cost of the casting.

Marvin E. Nevins Jr., Ampco Metal Inc., was chairman of the Nonferrous section meeting, which consisted of a discussion of melting practice with use of various types of equipment. The Technical group had "Nondestructive Tests for Soundness" as its subject, with Dale Trout, General Electric X-Ray Corp., and C. D. Foster, Magnaflux Corp., as speakers.—*Walter Gerlinger, chairman, publicity committee.*

E. Canada-Newfoundland

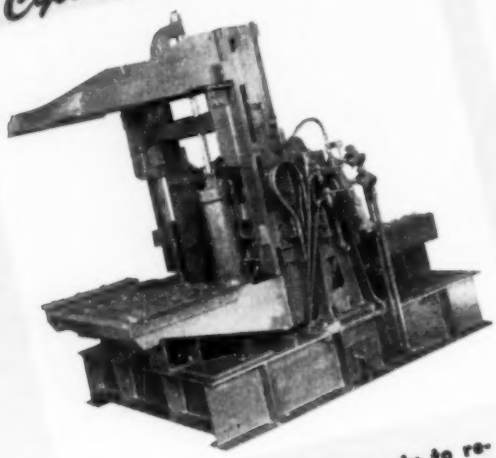
DISCUSSION sessions proved to be as popular as ever when the Eastern Canada - Newfoundland Chapter held its Oct. 20 meeting. This was the first of a series of group discussions planned for the year on iron, bronze and steel foundry practice.

The groups are under the chairmanship of E. C. Winsborrow, Canadian Car & Foundry Co. Ltd., Turcot Works; C. C. Brisbois, Robt. Mitchell Co. Ltd., and Ernest Tyler, Canadian Car & Foundry Co. Ltd., Longue Pointe Works. Each chairman has planned his year's program to cover the most important points for each type of foundry.

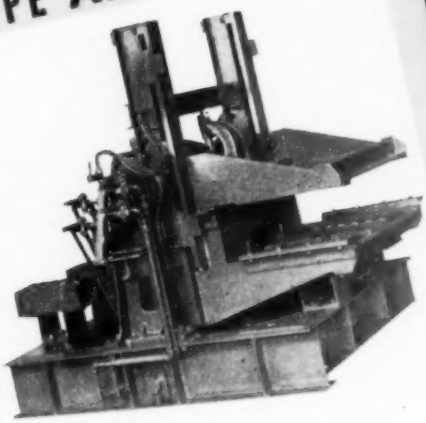
Chairman of the Program Committee, Arthur Cartwright, pointed out that one of the principal advantages of group discussions is the opportunity offered to each member to individually contribute to the success and usefulness of the meeting as a whole. He invited

(*Continued on page* 216)

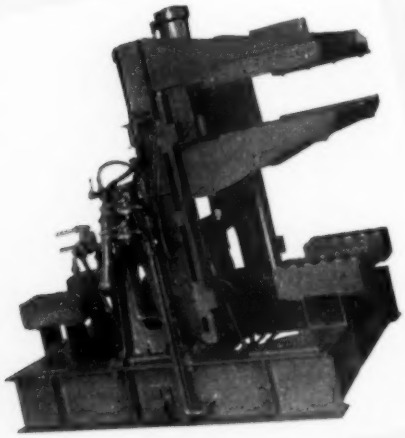
Cycle of INTERNATIONAL TYPE AN MACHINE



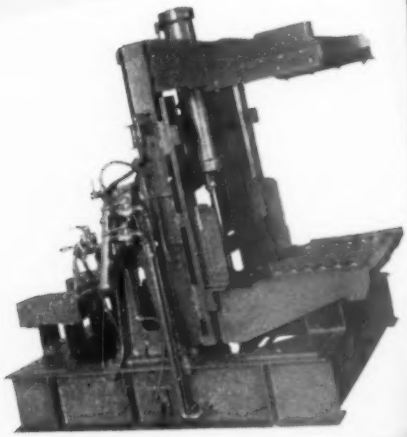
The machine is shown ready to receive the core box after it has been rammed.



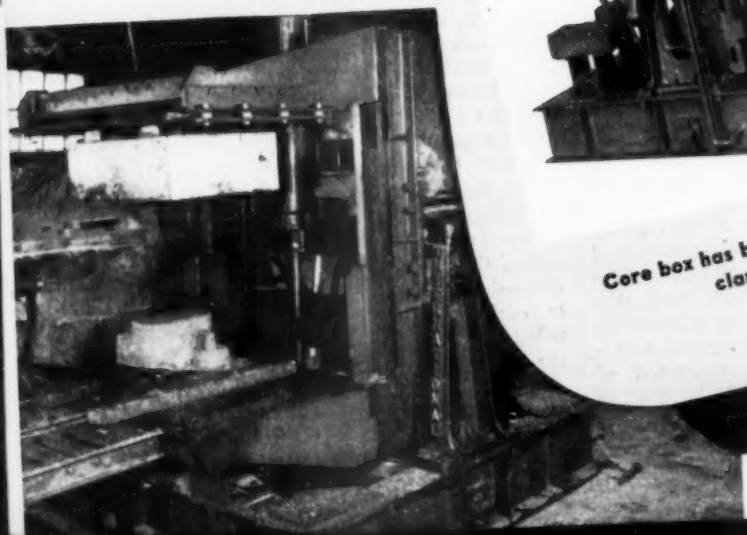
The draw frame has been moved into the position of clamping the core box and core plate.

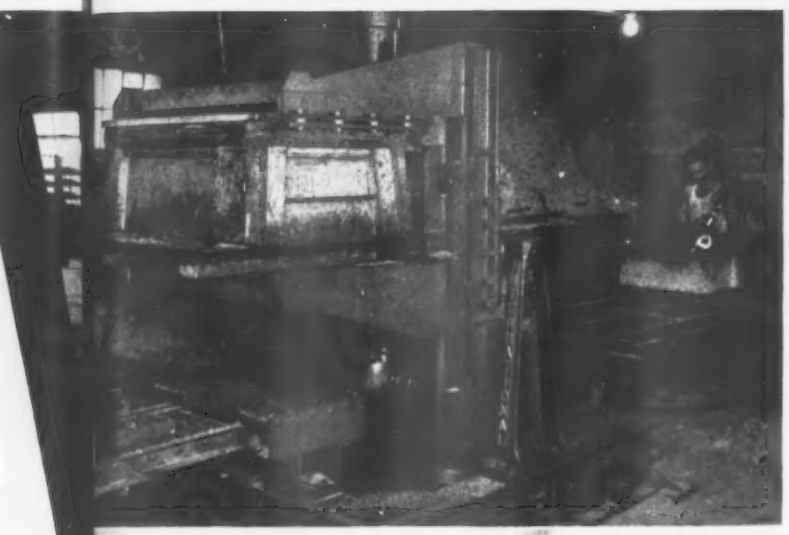


Core box has been rolled over in the clamp position.



The core and core plate have been drawn from the core box.



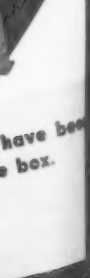


Hard to Draw . . . Short Run . . . Many Different Sizes of Boxes

INTERNATIONAL Type AN Machine for clamping and turning over core boxes and for drawing the core. No rigging time required. The core box is fastened to the turnover frame by sliding the cleats that have been fastened to the under side of the box into the grooves with which the turnover frame has been provided. Absolutely no adjustments are required. When boxes are changed from one size to another, irrespective of how much difference there is in the width, length and depth of boxes for which machine has been recommended, it automatically takes care of variations.

Has Air Clamp, Air Turnover, Air Draw Features. Flexibility and universal use has made the **Type AN Machine** popular. Easily adaptable to your molding problems. **Specify Internationals** and be certain of satisfaction.

INTERNATIONAL MOLDING MACHINE COMPANY 2608 WEST SIXTEENTH STREET CHICAGO 8, ILLINOIS



BILL

BY PAT DWYER

Drawings By TRICHEY

ONE night recently Bill showed me a clipping from the obituary column of the old home town paper setting forth in great detail the many excellent features in the long life of a citizen, highly esteemed by one and all, who recently had been gathered in by the Grim Reaper. He had been a patternmaker with the Orinoco Iron & Steel Co., ably managed for many years by one of the town's own local men, P. M. Hawn, and his place indeed would be very hard to fill. "Tim was quite a jolly old dog," Bill said. "Before he became a patternmaker he had been a builder and contractor and had built several churches. This may or may not have been responsible for his dignified and ecclesiastical appearance. When he turned out on Sunday in full regalia, high hat, long tail coat, gold headed cane and a hefty copy of *The Book* in the crook of his arm, he looked more like a member of the Ancient and Protective Order of Bishops, than many a man actually holding a journeyman's card in that august association.

"Later I discovered he had been cursed or coerced into this thing by a prim wife and a highly educated daughter. Women are funny that way. Not satisfied with letting their imagination run riot on their own garments, they invade what should be a sacred masculine field with IDEAS. Some men of course resist manfully, while others —"

"While others," I said, "live the lives of martyrs. They wear whatever they are told to wear. Bitter, if silent resentment, over a period of years develops an inferiority complex, stomach ulcers and hardening of the arteries. All that is common knowledge. I would be willing to wager a small sum—say two bits—that your friend Tim died from a combination of that kind."

"If you are so anxious to get rid of all your small change, you can hand it right over now. With increasing years Tim improved in disposition and appearance and developed a paunch that would do credit to an alderman fattening at the public crib for at least three full terms. He was in the best of health and spirits up to the last with all the internal organs and gadgets clicking merrily. He went to sleep as usual one night. The faithful old engine slowed down gradually and finally stopped. Tim's spirit in accordance with local tradition and popular belief, went out with the ebb tide which on that particular morning—as noted by some of the regular checker-uppers—set toward the harbor mouth at 2:15 a. m.

"With a vigilant wife and daughter, both highly articulate and bitter enemies of the Demon Rum, and with Mrs. Tim holding the purse strings in a vise like grip, the old boy had little opportunity to dip his beak in a bucket of suds, or to curl his tongue around a nip or two of the stuff, no doubt invented by the Evil One, and which as Mrs. Tim constantly pointed out, in the end bites like a blinkin' serpent and stings like a right peevish adder.

"On several occasions Tim, a former country boy, mildly had protested that serpents do not bite or chew their food. They bolt the stuff body and bones, then coil up in some quiet place, hang out the *Don't Disturb* sign and let the food circulate through their system. Many of the adders are harmless, and even those that pack a dollop of poison, squirt it through special fangs in the mouth and not through a hypodermic needle in the tip of the tail according to the highly efficient and painful technique of the wasp and the bummely bee. He might just as well have saved his breath for cooling his porridge. Perhaps I had better take that back. The Missus certainly would give him the eye if she caught him—and she was some nifty catcher, believe me—if she caught him attempting any low, vulgar trick of that kind."

"Seems to me," I said, "he should have asserted himself. Head of the house and all that kind of thing. Some one should have told him that the only way to manage wives is to catch 'em young, treat 'em rough and tell 'em nothing."

Bill snorted audibly through his nose.

On Sunday, Patternmaker becomes pattern

A good healthy snort of nicely blended pity and amazement. By way of supplementing the snort and as indicating in a general way that he considered me a total loss, he said, "Are you kiddin'?"

"O. K.," I said, "OKAY. Let it go. Objection sustained and ill advised remarks stricken from the record. Outside of his appearance on the sabbath day, futile protest in regard to snakes, gulping his porridge red hot, handing over his pay intact and studiously keeping his eyes away from the juice of the grape, all negative virtues, what other evidence can you produce to show that Tim was an actual human being and not merely a fairly reasonable fac-simile thereof?"

"Well," said Bill, "I'll tell you. Tim was a nice, mild, inoffensive old lad, but he had quite a streak of humor in his makeup and he did love to drench his insides discreetly now and again with three or four fingers of snake juice. His sense of humor carried him over the arid periods, helped him to find a drink occasionally where apparently none existed, and above all gave him the keenest delight in mystifying Mrs. Tim as to where, when and how he popped up in the old homestead with a breath that to say the least was no attar of roses. On these occasions she referred in a general way to snakes and adders and things and made it quite plain that she was not confining her remarks to the specimens that crawled around on their —er-ah—stomachs and indulged in a little promiscuous biting and stinging. She opened all the doors and windows and confided audibly to her daughter that she knew she would be humiliated that day. The night before she had dreamed of a new hat, a dream that thrilled her to the tips of her fingers and toes, and every one knows that dreams always go by contraries.

"This was the only weak point in the lady's otherwise perfect armor. Something like that Greek Heel whose mother grabbed him by one heel and dipped him in a vat of some kind of protective googum. Mrs. Tim had a copy of a standard work of reference *Oriental Guide and Interpretation of Dreams* issued by the altruistic makers of a marvelous remedy guaranteeing to cure anything from spots before the eyes to a broken leg. Testimonials by the score, backed by actual photographs of grateful patients appeared throughout the book, cleverly sandwiched in between list of dreams and their interpretation. In one extreme case a shot of the squaggam inserted between the

(*Concluded on page* 149)

FREE MOVING CRANES
Aid Pouring for BETTER CASTINGS

Poor returns from the flasks often result when too much manual handling is put into the movement of heavy ladles. American MonoRail free moving cranes assure careful pouring. Little attention need be paid to the weight and movement of ladles. One man does the work of two or more.

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A 56 page book showing successful applications of American MonoRail Systems

THE AMERICAN MONORAIL CO.

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The control of electrode clamps from the floor eliminates the hazardous task of climbing over the hot furnace to slip or change electrodes. More accurate electrode positioning by means of hydraulic power transmission reduces costly power and electrode consumption. These and other Hydro-Arc improvements provide more melts per day at lower cost . . . improve working conditions . . . save manpower.

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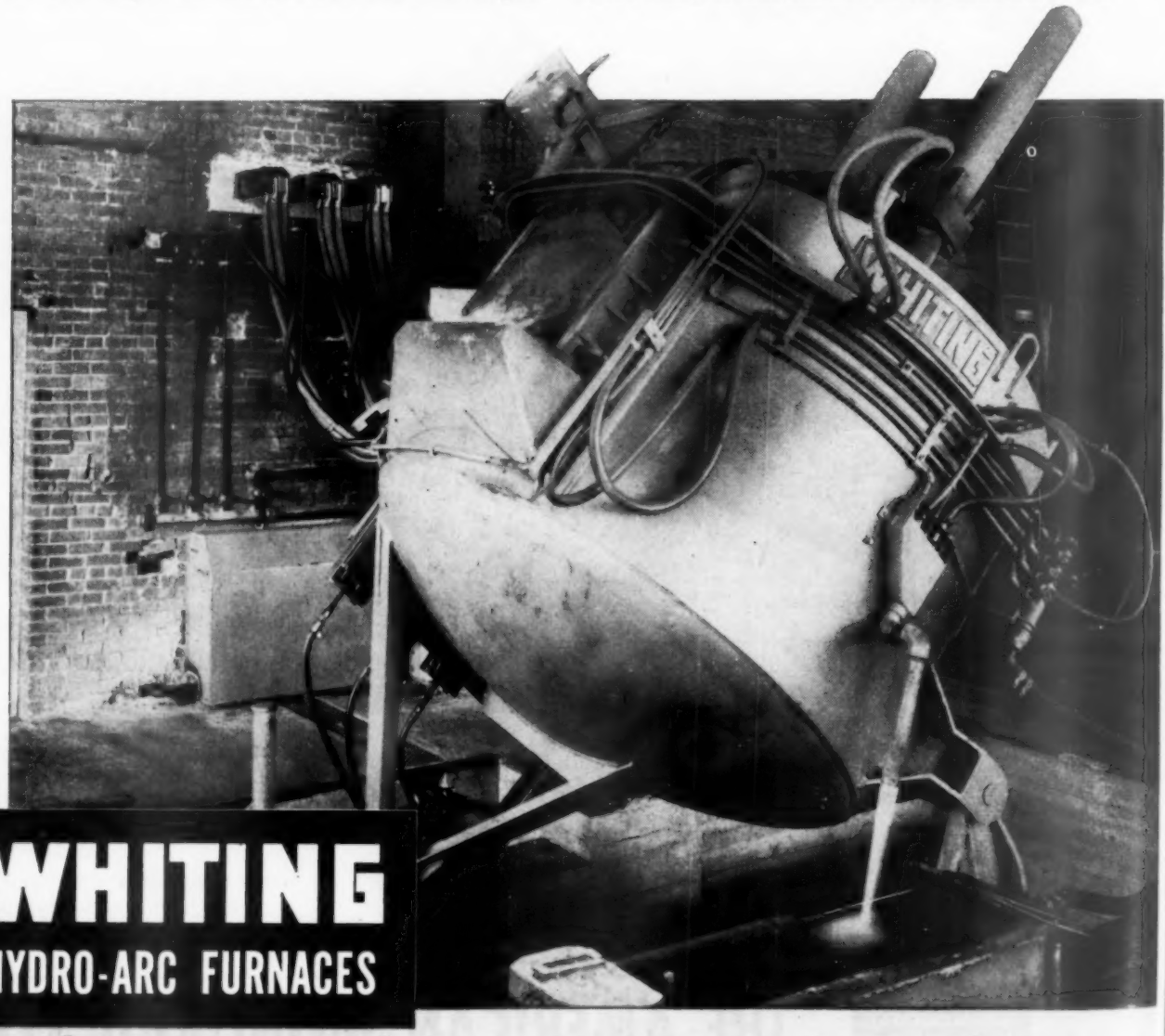


WHITING

HYDRO-ARC FURNACES

Electric Melting At New Low Cost

(*Concluded from page* 146)

clinched teeth of a man who had ceased to breathe, but in whom rigor mortis had not yet actually set in, had started the heart action. That was two years ago and 'today' the statement continued, 'that man is in perfect physical condition and thinks nothing of sawing and splitting two cords of wood per day.' This invaluable book was attached by a piece of string to a hook above the kitchen sink for ready reference.

"The lodge in which Tim was a shining light put up a special meeting one night in honor of certain visiting dignitaries. The lady advanced him $10 to maintain a front, but shrewdly calculated that he could get by on maybe $5 or $6 at the outside. She would be pleased to see the remainder of the stuff laid on the line when he returned, or on the kitchen table in the morning. Between one thing and another including a rather hilarious seance during and after the lodge meeting Tim discovered he had $2 in his poke when he cast anchor in the old homestead between 2 and 3 o'clock. Even in his muddled condition he realized the danger of leaving so much wealth lying around loose. One of the speakers that evening in a patriotic address had stressed a popular slogan of the day, 'What we have, we hold!'

"He cunningly decided to hide the $2 bill, retrieve it in the morning and then dribble it out judiciously during the week at Joe's Place, a well known oasis in the desert and about half way between his home and the plant gate. The Oriental Dream Book caught his wandering eye and he slipped the bill in between two pages. The page on the left paraded a list of dreams and their interpretation. The page on the right showed a combined elevation and sectional view of a human figure surrounded by a circle of insects, beasts and fishes, and with lines showing the push button control exercised by these creatures over the pumps, compressors, light, heat, power, air conditioning and one thing and another in the well designed and equipped engine room.

"So far as hiding the jack was concerned Tim's strategy, approach and application, were perfect. He knew exactly what he was doing. Every movement was performed with the nicest degree of precision and accuracy. He tumbled into bed, happy and contented in realization of the fact that definitely he was one up in the matrimonial handicap. All that remained was to rise in the morning, deftly snatch the piece of change from between the leaves of the book, transfer it to an almost perennially empty hip pocket and go on his way rejoicing.

"Up to that period in his life Tim openly had scoffed at all manner of dreams, superstitions, charms, lucky pocket pieces, lucky and unlucky days, and particularly he had ridiculed the popular superstition that $2 bills are unlucky. On more than one occasion he had declared boldly that he wished he had a pocketful of the long green.

"When he awoke in the morning he searched frantically through all his pockets and through every conceivable and inconceivable place in the room, and then nearly collapsed when he realized that he could not remember where he had deposited the bill for safekeeping. He was positive he had brought it home. He remembered distinctly cooking up the clever scheme of retiring the bill from circulation for at least a limited period, but grope as he would he could not place his mental finger on the hidie hole. 'Twas indeed a chastened and sober Tim who attacked the breakfast egg, the shredded wheat biscuit, the two prunes and a cup of the revolting liquid made by pouring hot water over a pinch of refuse from a sawmill. In Mrs. Tim's opinion this widely advertised and purely vegetable product was second in potency only to the googum referred to so handsomely in the Oriental Dream Book. In addition to many other exemplary qualifications the lady had implicit faith in her ability to mix up the vitamins, minerals, carbohydrates and all that there kind of stuff in proper combination and amount to produce maximum vitality and energy at minimum cost and effort.

"As the Master, ha ha, reached for his hat with one hand and the knob of the kitchen door with the other hand, he was petrified like a bird dog when the lady pointedly inquired if he had not forgotten something!

" 'Forgotten something,' he says to himself, 'I'll say I have forgotten something.'

"However, he rallied quickly. The old battle axe was good, but she could not possibly be thinking of what he had in mind. He put on the Sunday face and said why no, so far as he knew he had not forgotten anything.

" 'Kindly stop beating about the bush,' she said. 'Where is the remainder of the expense money I advanced you yesterday? And don't tell me you squandered the entire amount like a drunken sailor ashore for the first time in six months. I shall be pleased,' she said, 'to see 2 or 3 or possibly 4 or 5 dollars.'

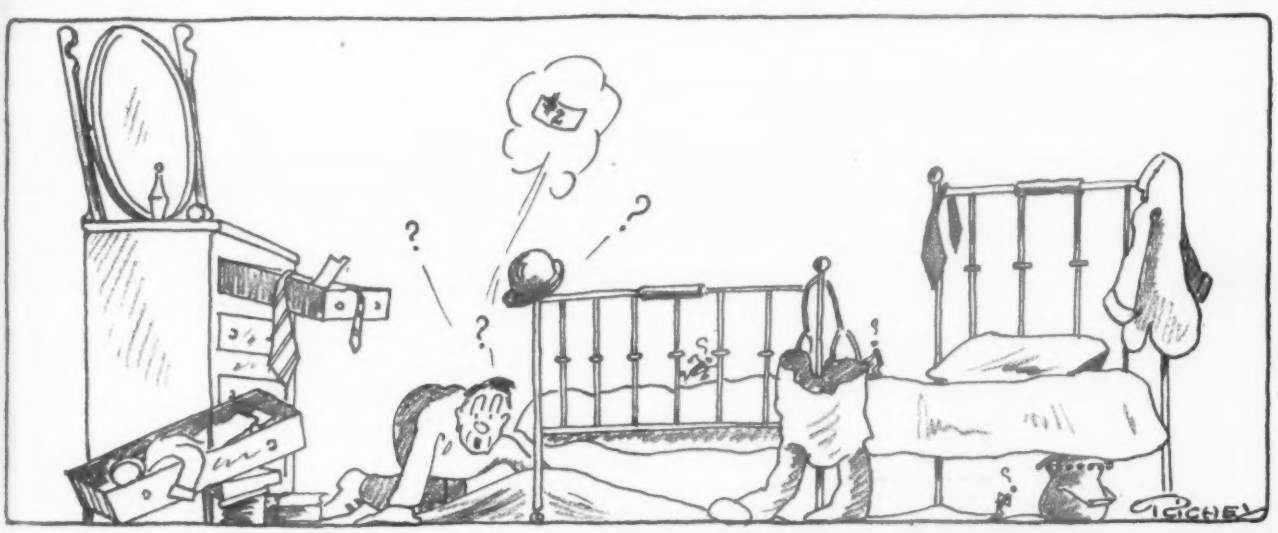
" 'Who wouldn't?' says brave Tim. 'Believe you me, nothing would give me greater pleasure than to lay the stuff on the line. Unfortunately I am no miracle worker. At one stage of the game I had hopes of salvaging about 2 dollars, but alas it went like the rest. I can lay my hand on my heart and truthfully and positively state that I don't know where it went.'

" 'Well,' she said, 'we shall see. Last night I dreamed of a horse race and whenever I dream of horses I invariably receive a small sum of money.'

" 'Horse races,' Tim declared in his best Sunday-go-to-meeting manner, 'are notoriously uncertain, especially where $2 bills are involved.'

"That night she told Tim triumphantly that now perhaps he would believe in dreams. 'After you left this morning,' she said, 'I took down my Oriental Dream Book and out from the pages fluttered a $2 bill. I just knew I was going to get a small sum of money. I must have placed it there some time when I was in a hurry and then forgot all about it. Am I not a lucky person?'

" 'Lucky?' says Tim. 'I mean to say, my dear, you never spoke a truer word'."



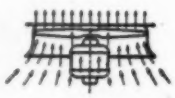
No $2 bill, but the room looked as if it had been hit by lightning, a tidal wave and a cyclone

17 REASONS WHY...

This Modern St. Louis Foundry has FRESH AIR

Adequate foundry ventilation is no problem with the right equipment—and "right equipment" of course means "Propellair." This versatile, high-efficiency development delivers greatest air volume from least horsepower, whether installed on roofs or floors, or in ducts, walls, or windows.

Shown here are only seventeen of the twenty-nine Propellair Fan installations that control heat, moisture, dust, and fumes at a well-known St. Louis foundry. The varying curvature, pitch, and thickness of Propellair airfoil-section blades produce an axial air flow at high velocity because the *whole* fan works—not just the *tips*.



Curved Entrance Ring Virtually Eliminates Eddy Currents, Flow Restrictions.

Modern Propellair equipment merits your investigation *now*, for today *and* tomorrow.

Impulse Is Imparted Over Full Area of Scientific Airfoil-Section Blades.

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72 pages of facts, figures and installation information, showing fans for every foundry need. Ask for Catalog No. 10F.

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PROPELLAIR INC.
SPRINGFIELD · OHIO

FOUNDRY ANNEALING OVENS

Are Serviced by Fork Truck

THE Milwaukee Malleable & Grey Iron Works, Milwaukee, recently replaced its steam-powered oven charger with a 400-pound fork truck which has the advantage of being easy to maneuver. The truck, manufactured by the Clark Tructractor Division, Battle Creek, Mich., loads the oven in 1½ hours, unloads another in the same time, and then can be used for the remainder of the day for hauling, stacking and lifting jobs for which the special oven charger would not be suited.

The nine annealing ovens in this foundry operate on a 6-day cycle. For example, an oven loaded on Tuesday is unloaded the following Monday. When the oven is loaded and sealed the temperature is raised gradually to 1700-1750 degrees Fahr. and held there long enough for thorough penetration. This usually is 1½ to 2 days. The oven then is cooled to 1200-1250 degrees and opened. During the next 48 hours the temperature is reduced to 600-650 degrees, when it is safe to begin unloading.

A stack consists of four pots 18 inches wide, 28 inches long and 18 inches deep. This makes a stack 60 to 65 inches high and weighing about 1600 pounds. Each oven holds 50 stacks and always is loaded to capacity.

The truck now used for loading and unloading first removes the 2-ply brick door, and then may be driven quickly to any part of the oven to deposit or pick up a stack of pots. Working conditions are said to be better for the driver of the truck. He is near to the load and has good visibility. With the 60-inch height, the driver can easily take the truck into side areas where the ceiling height is only 70 inches. A ¼-inch shield plate protects the driver from the direct heat of the pots, and the speed of the truck is said to permit the driver to get in and out of the oven before the high oven temperature has an appreciable effect. The only part of the truck affected by this service are the tires, which tend to dry out as a result of the oven heat and hot ashes on the floor.

Winners of Essay Contest Picked

In its effort to encourage youths in foundry careers, the Apprentice and Junior Foundrymen Committee of the Chicago Chapter, A.F.A., has been cooperating closely with Chicago trade schools. Most recent activity of the committee to instill greater interest among students enrolled in foundry courses at Washburne Trade School and Crane Technical High School was to sponsor contests on "Why I Would Like To Work in a Foundry."

Through courtesy of the Electric Steel Castings Co., Speedway, Indianapolis, the committee, headed by Bruce L. Simpson, president, National Engineering Co., Chicago, showed the students a movie film illustrating modern electric steel foundry practice. In presenting the film, Mr. Simpson announced the essay contest, and to provide incentive personally offered a $10 prize for the best paper at each school.

Winner at Washburne Trade School was Donald Longanecker. Carroll Garess placed second, and Donald Swanson third.

The essay of John Frontern, now serving with the U. S. Army, was judged best at Crane Technical High School. Second place went to Richard Sosnika and third to Christ Kamberos.

New Representative

Hill & Griffith Co., Cincinnati and Birmingham, has been appointed representative of the National Engineering Co., Chicago, in the states of Oklahoma, Arkansas, Mississippi, Kentucky and the eastern part of West Virginia.

LET'S RING IT AGAIN!

Every Sterling Grinding Wheel we make is dedicated to limitless progress in a free, unshackled America.

Merry Christmas! The old wish, ever new, is important to everyone this year.

In spite of war's alarms, of pestilence, of rumors that try our confidence, of catastrophe and sad tidings, the spirit of Christmas returns to bring some measure of hope and happiness to all mankind.

This year, more than ever, we need Christmas. We need to apply it to our daily living—throughout the entire year. We need the spirit of Christmas in our homes, our business, our social affairs.

We need the spirit of Christmas for the solution of our present problems of war and the equally important ones of peace. We need goodwill toward men . . a group feeling of responsibility for the welfare of others—farmers, politicians, office employees, men of labor or management—if we are to bring America to the high point of efficiency and prosperity she deserves.

As a nation, we need the spirit of tolerance toward all peoples so we may more closely approach the ideal in our future economic and political contacts with other nations.

We must have liberty to do what should be done. We need the cooperative spirit which our forefathers used to create freedom and a sense of unity among Americans.

The Liberty Bell—let's deck it with holly—and ring it again!

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THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
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THE WHEELS OF INDUSTRY

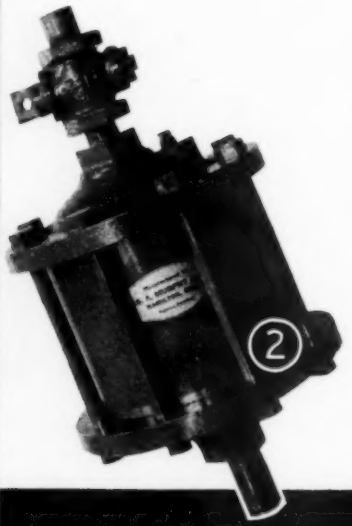
NEW EQUIPMENT & SUPPLIES

(1)—Disc Grinder: Kindt-Collins Co., 12651 Elmwood avenue, Cleveland 11, has developed a new all-purpose disc grinder for any type of metal, wood or plastic material. It is made in two similar models, regular and heavy duty, the regular model using cloth or paper abrasive discs, and the heavy duty model employing an inch-thick, heavy duty grinding disc. The grinder has a 30-inch disc with 26-inch high grinding area. Hydraulic controls eliminate all gears, worms and jack screws for raising, lowering and tilting the table. An accurate position stop provided on the protractor stops the table in any position from 45 degrees down to 15 degrees up. The table is perforated to channel dust into highly efficient dust guards. Paper or cloth discs may be removed and replaced without removing the steel disc. Disc speed is 800 revolutions per minute, giving a rim speed of 6260 feet per minute. The two models take a 3 or 5 horsepower motor.

1

(2)—Trap: Jas. A. Murphy & Co., Hamilton, O., has developed a no-prime, no-leak trap for use in the automatic evacuation of large quantities of heavy condensate from aftercoolers, separators, tanks and other containers. It is substantially built, has a large capacity (3 pints) and has a large throat for quick expulsion of accumulated condensate. Known as the Zip Action trap, it is said to combine the advantages of both the ball float and inverted bucket types, its quick action preventing ordinary dirt or heavy oil from interfering with proper seating of the valve. Cleaning, if necessary, is accomplished by removal of the bottom head. The trap measures 8¼ inches in diameter and 10½ inches in height, weighs 30 pounds and accommodates pressures up to 125 pounds per square inch. Special units are available for higher pressures.

(3)—Face Shield: Boyer-Campbell Co., 6540 St. Antoine street, Detroit 2, announces a new series of face shields consisting of four models, each of which is identified by variance in design of the head gear. For each model there is a choice of three different thicknesses and three different sizes of cellulose acetate windows, also three different sizes of 24-mesh screen windows for heat protection and a fiber front for scarfing and welding. All parts are interchangeable. Back head band is completely adjustable for snug fitting.


2

(4)—Diamond Wheel: Norton Co., Worcester, Mass., has developed a vitrified bonded diamond wheel, supplementing its resinoid bonded and metal bonded diamond wheels introduced some time ago. Outstanding feature claimed for the wheel, and also

(*Continued on page* 154)

3

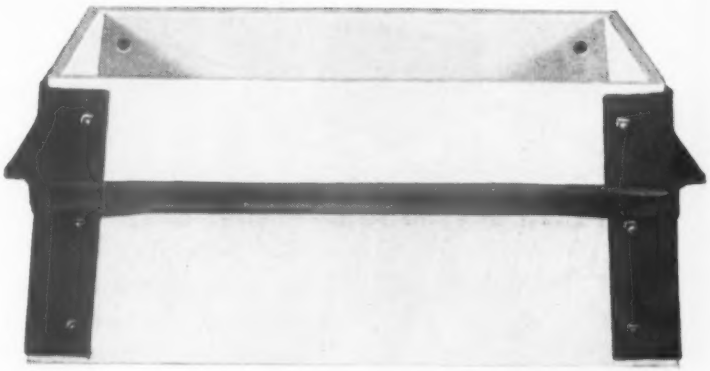
4

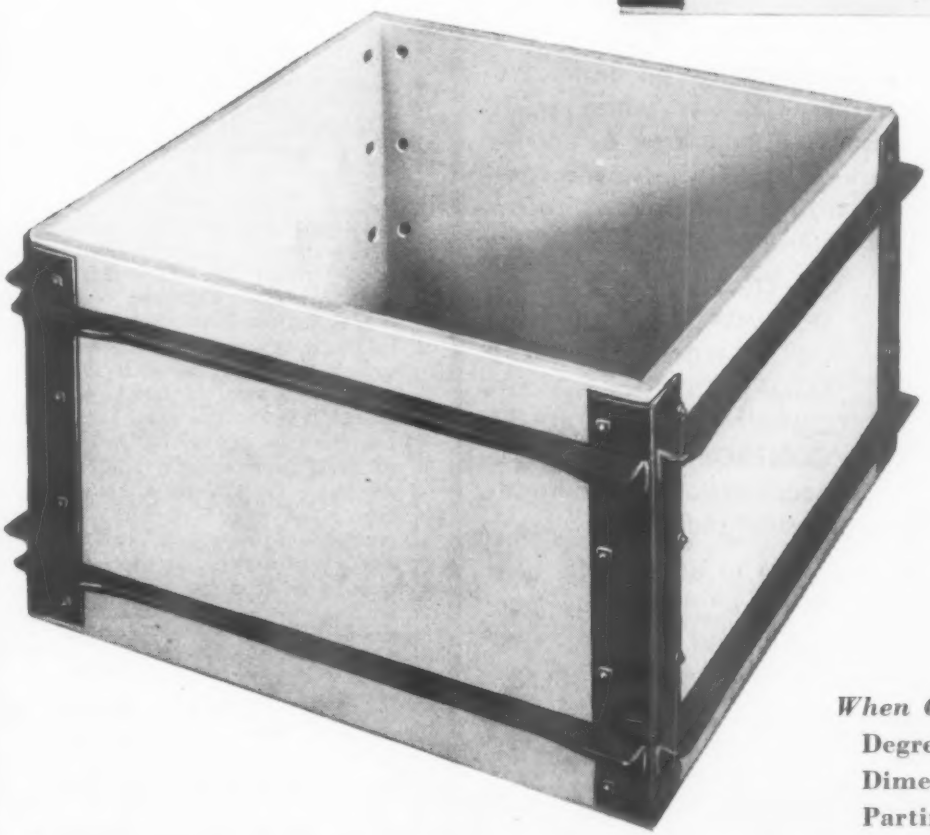
NON-BURN NON-WARP SLIP JACKETS

Shed Molten Metal Like Water Off a Duck's Back

Runouts — Spill-overs of Molten Metal will not affect CMD Slip Jackets.

Smooth Fit — Non-Sticking — Strips Clean from Mold.





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Corner Pieces
2" x 2" x ⅛"
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Reinforcements
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Bolted and Arc-Welded

When Ordering SPECIFY:
Degree of Taper; Size of Flask. Dimensions Above and Below Parting

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WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

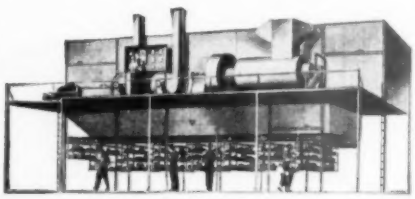
PANGBORN CORPORATION · HAGERSTOWN, MD.

(*Continued from page* 152)

for a vitrified bonded diamond hand hone, is the combination of fast cutting action with long life. It also is said to have little tendency to glaze or load when grinding shank steel.

Tinning Flux: Air Reduction Sales Co., 60 East Forty-Second Street, New York, 17, has developed a flux designed to promote uniformly successful tinning of cast iron prior to brazing. It is claimed the flux overcomes the difficulties encountered in tinning cast iron due to the graphitic carbon content, and makes possible highly satisfactory tinning especially of metal high in carbon and silicon, or low in combined carbon. The flux does not take the place of the regular flux used in the actual brazing operation.

Core Oven: Despatch Oven Co., Minneapolis 14, announces a core oven in which the cores travel on four horizontal levels. The cores are loaded at an open section, then travel vertically to the baking oven at the top where they make two horizontal passes in the heating system. As the cores enter the



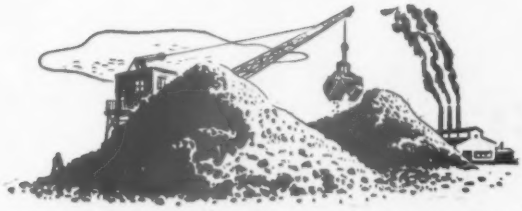
third horizontal level they pass through a cooling zone. A typical oven has capacity for drying 50,000 pounds of cores every 8 hours. Maximum temperature is 650 degrees Fahr., but most of the baking is at temperatures between 450 and 550 degrees. Overall dimensions are 13 feet wide, 27 feet high and 52 feet in length. The oven is fired with a combination gas and oil burner mounted on a platform. Conveyor speed is adjustable from 1 to 4 hours baking time. The entire system has automatic temperature control and all approved safety equipment. Interior uniformity may be checked periodically through a six-point switch arrangement with control instrument.

Photo Layouts: Eastman Kodak Co., Rochester, N. Y., announces materials for a simplified method of printing working drawings directly on metal. A new layout paint is sprayed in ordinary room light directly on a primed surface reasonably free from loose dirt or grease. The previously prepared drawing with black ink on a transparent or translucent material is laid in contact with the plate and exposed for a few minutes under arc or mercury vapor lights. The drawing then is re-

(*Continued on page* 158)

Number 6 of a Series: "Looking at the 5 essential things you never see in electrodes!"

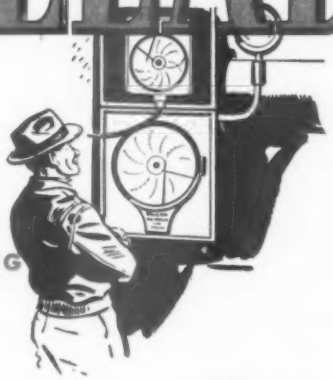
Formula for



RAW MATERIALS SELECTION

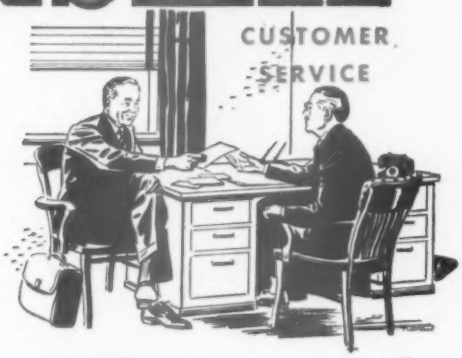
MANUFACTURING EXPERIENCE

LEADERSHIP



MANUFACTURING CONTROL

CUSTOMER SERVICE



plus Continuing Research

Continuing research has fed major improvements into "National" carbon and "Acheson" graphite electrodes for electric furnaces for upwards of 40 years. These improvements show up as steadily higher impact resistance, more uniform size, greater current capacity, slower consumption, and lower cost per ton of electric steel.

Without continuing research, our carbon and graphite electrodes could not have attained and held *leadership!*

Yet you cannot *see* "continuing research" in the products themselves. So we remind you again to investigate this quality, as well as the four other "essential things you never see in electrodes." The others: Raw materials selection, manufacturing experience, manufacturing control, and customer service. These things are present in every "National" and "Acheson" electrode. Your inquiries are invited.

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
GENERAL OFFICES: 30 East 42nd Street, New York 17, N.Y.
DIVISION SALES OFFICES: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco
In Canada: Canadian National Carbon Company Limited, Welland, Ontario

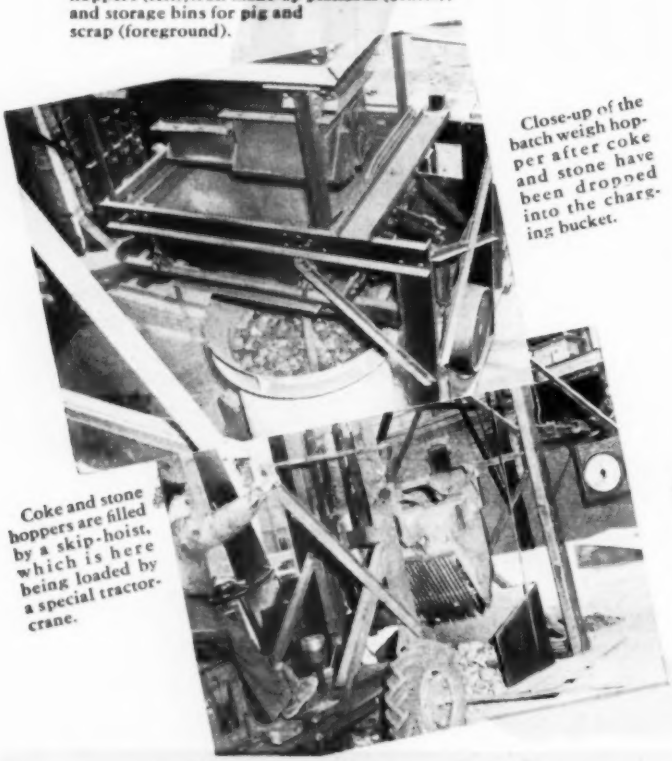
The registered trade-marks "National" and "Acheson" and the "National" and "Acheson" Seals distinguish products of National Carbon Company, Inc.

KEEP YOUR EYE ON THE INFANTRY . . . THE DOUGHBOY DOES IT!

MECHANICAL

The material yard showing coke and stone hoppers (left), iron make-up platform (center), and storage bins for pig and scrap (foreground).

"One of the best investments we ever made for improving working conditions," says the General Foundry Superintendent at Worthington Pump and Machinery Corporation, "because it has performed satisfactorily right from the start and lived up to all promises. Whiting Charging Equipment has made a big difference in our manpower problem by getting rid of the HARD work connected with cupola charging."

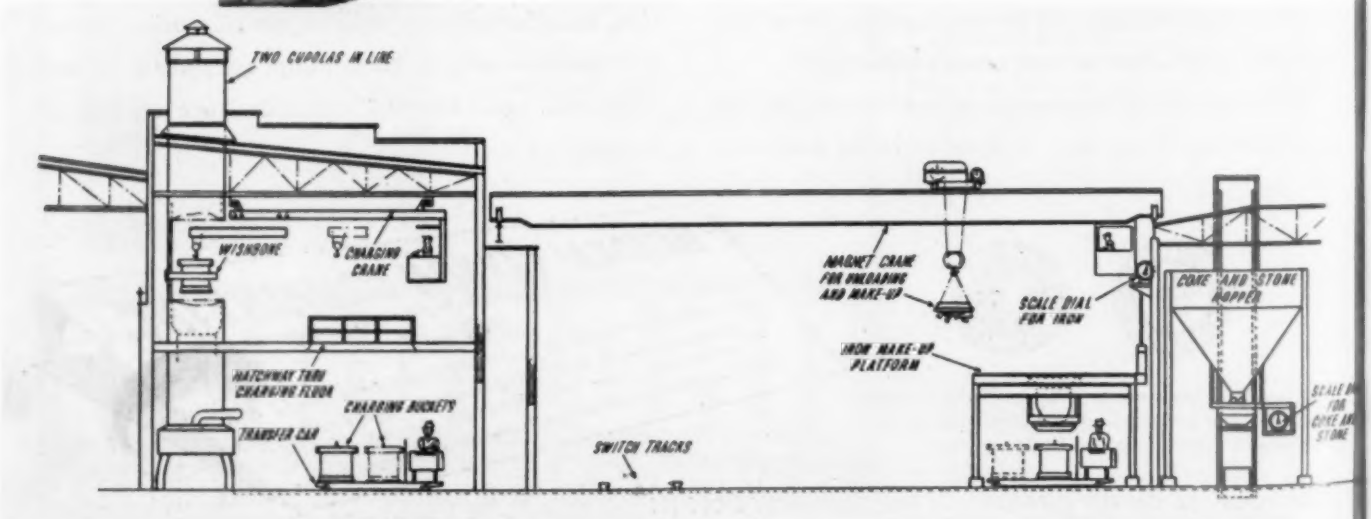


Close-up of the batch weigh hopper after coke and stone have been dropped into the charging bucket.

Coke and stone hoppers are filled by a skip-hoist, which is here being loaded by a special tractor-crane.

INTERESTING FACTS about the

- The crane operator is the only man working at the charging floor level.
- The same crane that makes up the charges is also used to unload incoming materials by magnet and clam-shell bucket from switch track to storage bins.
- Depositing excess materials on the make-up platform saves many trips for the craneman to the main storage bins.
- The scale dial for iron make-up has snap-on markers, and is in easy view of the crane operator. The scale dial for coke and stone is near the ground for convenience of the transfer car operator.
- Bottom gates for releasing charges into charging buckets are pneumatically operated by the man on the transfer car.
- Coke and stone raised by the skip-hoist is directed into its correct hopper by a flap gate.
- The transfer car is powered by a gas-electric drive—handles



CHARGING at WORTHINGTON

"Now it takes only four men instead of ten to charge these two gray iron cupolas," says Worthington's Harrison (N. J.) Works Manager. "Each 3,000 lb. cupola charge is made up in about three minutes, so that transfer car and charging crane operators can also work in 3-minute cycles and eliminate waiting time. As a result of this efficiency and the smaller number of men required, our charging costs are only about 30% or 35% of what they were before the Whiting Equipment was installed."

The magnet crane brings a load of pig from storage bin to make-up platform. Any excess above the amount needed for the charge is deposited on the platform.

CHARGING OPERATION

13 tons per hour with less than a gallon of fuel. The special tractor-crane for carrying coke and stone from storage piles to skip-hoist is gasoline powered. The skip-hoist is electrically driven.

- The Worthington installation includes two No. 9 Whiting Cupolas, 66" inside diameter. The Wishbone System of charging is used, employing cone-bottom buckets.
- Two charging buckets are used. While one is raised by the charging crane to the charging floor and into the cupola, the other is being filled by the transfer car operator, who then spots his car under the hatchway.

Close-up of the iron make-up platform showing square opening to batch weigh hopper, surrounded by piles of scrap and pig of various kinds.

Transfer car with cone-bottom charging bucket ready to receive coke and stone, which are weighed in the hopper by the car operator before being dropped into the bucket.

WHITING CORPORATION

15607 Lathrop Ave. Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Washington, D. C. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario.

WHITING

FOUNDRY EQUIPMENT

ELEMATIC
THERMOCOUPLE
MODEL 4000 — for wall type indicator or recorder. Has flexible arm adjustable to any angle without use of tools
For Instantly and Accurately Checking the Temperature of all Nonferrous Molten Metals
Everyday, an increasing number of foundries are adopting the more efficient Elematic Thermocouples. Not only because they give such dependable temperature control, but because they are more economical.
All Elematic Thermocouples are equipped with our own, exclusive Metalast Protection Tubes—long life tubes which can be easily replaced without damaging or discarding the thermocouple, and at a saving of time and labor.
Made of a special heat resisting alloy, in types for both furnace and ladle use, Elematic Thermocouples with Metalast Protection Tubes have been tested and approved by scores of the largest brass and copper foundries in America.
DOUBLE THE LIFE OF YOUR THERMOCOUPLES WITH THIS REPLACEABLE METALAST TUBE
Simple to attach . . . fully protects thermocouple from slag or molten metal . . . drilled from solid special alloy stock without welds or seams. Available in 6" or 8" lengths with ½" pipe thread.
ELEMATIC EQUIPMENT CORP.
6046 WENTWORTH AVENUE, CHICAGO 21, ILLINOIS

(*Continued from page* 154)

moved and the metal flooded with warm, weak ammonia water. A vigorous spray of tap water washes away the entire exposed coating, leaving white lines where black lines appeared in the drawing.

Self-Propelled Crane: Thew Shovel Co., Lorain, O., has designed a new 20-ton crane in which the turntable engine is used to power the carrier as well as the turntable. The unit, mounted on six wheels, is operated by one man. It was

developed to meet military requirements but is designed for use wherever unlimited mobility and general crane versatility can be employed. Four travel speeds up to 7 miles an hour are provided, both forward and reverse, and a 20 per cent grade can be climbed. Gasoline or diesel engines are available.

Spectrometer: North American Philips Co., 100 East Forty-Second street, New York 17, announces a new x-ray spectrometer which provides an accurate and rapid method for measuring distribution and intensities of x-ray reflections. Intensity measurements are quantitative-

ly accurate and can be used to determine composition of crystalline mixtures. It is adaptable for use by unskilled operators in routine process control as well as in the research laboratory. Power is taken from any 115 volt, 60-cycle alternating-current outlet.

Skin Lotions: Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh 8, has added three new creams and lotions to the former six varieties of products designed to form a protective physical barrier on the skin against the irritants to which workers are exposed in industry. One forms a semi-water repelling barrier against all types of cutting oils and cooling compounds, solvents and degreasers. The second is a water soluble heavy duty lotion to guard against dermatosis, magnesium and zinc dusts, fiberglass, sharp particles, fruit and vege-

(*Continued on page* 160)

PENOLYN CORE OIL MEANS

HARD BAKING!

There's not a plane, or ship, or tank, or gun that didn't start to war from a foundry. Indeed, the whole tempo of our production is set by foundry operations—and whatever can speed those operations will bring Victory nearer.

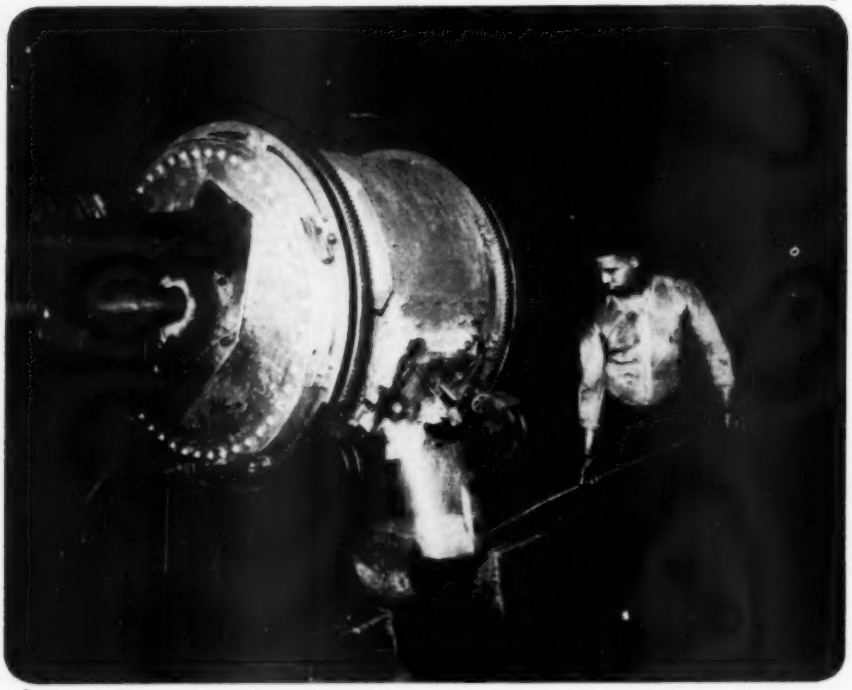
That's why Penolyn Core Oil has such a big job to do—and it's doing that job! Penolyn Core Oil helps to produce more perfect cores . . . cuts the number of time and profit wasting rejects. It bakes hard, cleans fast, holds gas-forming tendencies to a minimum.

Penolyn engineers are always on call. Why not call one in to discuss your foundry problems?

Penola
Reg. U.S. Pat. Off.

PITTSBURGH, PA. • **NEW YORK** • **CHICAGO** • **DETROIT** • **ST. LOUIS**

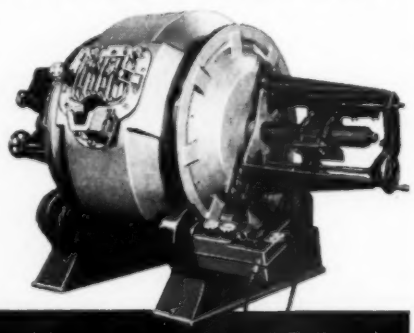
Postwar production will demand speed, quality and economy—Detroit Electric Furnaces give you all three



SPEED: Detroit Rocking Electric Furnaces give faster melting and more pounds per man hour. They melt as many as eight ferrous or sixteen non-ferrous heats in one 8-hour day—and each heat may be of an entirely different mix if desired.

QUALITY: Because of their automatic stirring action under non-oxidizing conditions—and because of their precise control over time, temperature and composition—Detroit Furnaces assure superior metallurgical results.

ECONOMY: Detroit Furnaces insure lower metal losses, less machine shop scrap, better machinability and a higher percentage yield of perfect castings of uniform quality. Versatile, flexible and fast, the Detroit Rocking Electric Furnace has proven itself to be the most efficient foundry melting unit for the widest variety of metals and alloys. Available in sizes from 10 lbs. to 4 tons.



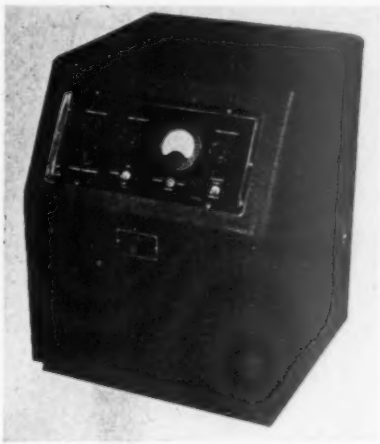
DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

(*Continued from page* 158)

table fuzz and chlorinated solvents. The third reduces nervous perspiration and helps to prevent rusting of polished metal surfaces. All creams easily are removed from the skin with mild soap and warm water.

Lubricant: Chicago Mfg. & Distributing Co., 1928 West Forty-Sixth Street, Chicago, is offering a highly concentrated gage lubricant. Claim is made that not only does this lubricant reduce wear, but it also reduces inspection time, and prevents the sticking of gages overworked when gaging with plug, ring, snap or thread gages. Can be used as a rust preventive. The oil is packed in 4-ounce tubes, 12 tubes to a carton, and in gallon and 5-gallon containers.

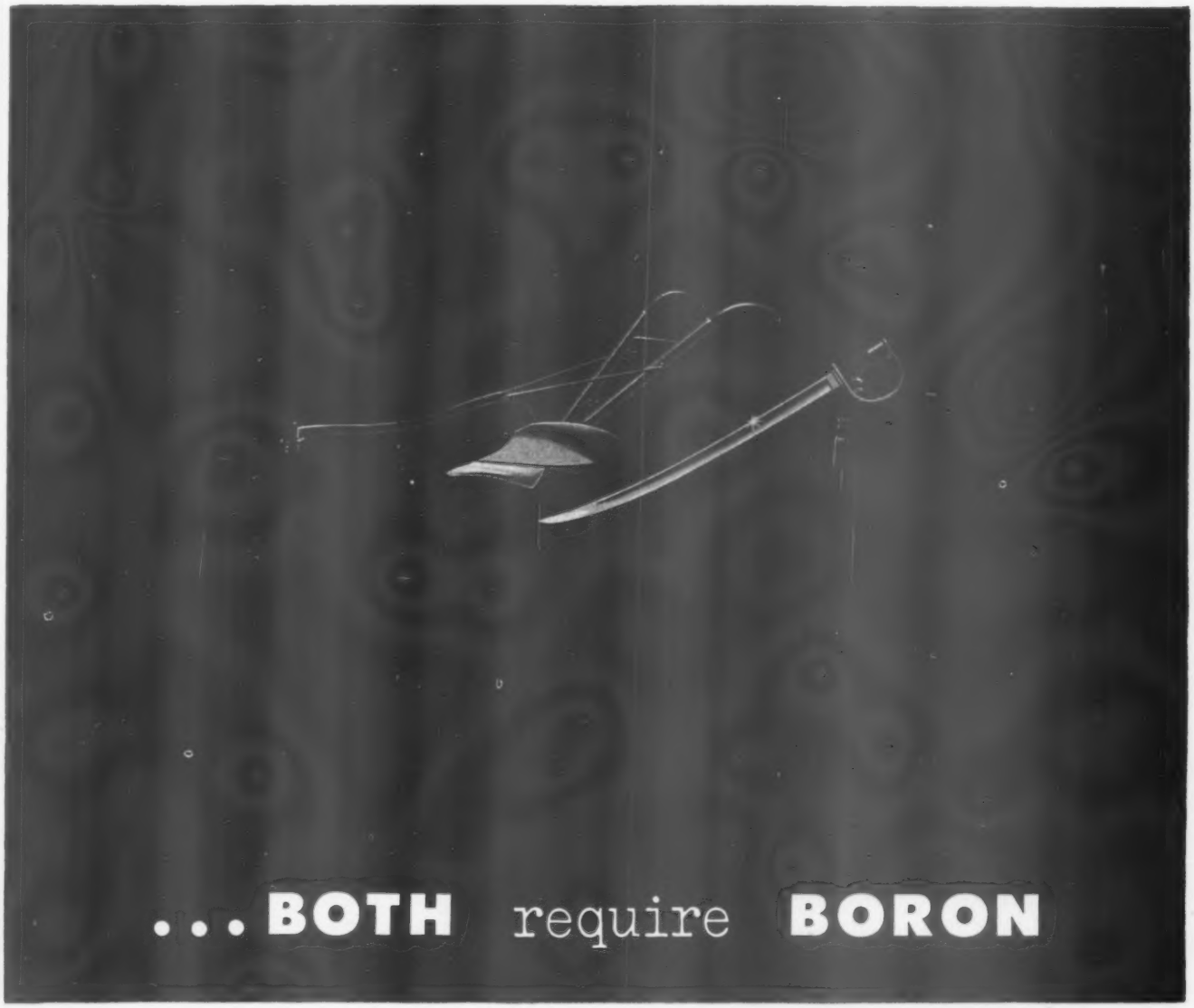
Voltage Regulator: Harry W. Dietert Co., 9330 Roselawn avenue, Detroit 4, announces a new, large electronic voltage regulator for supplying constant voltage alternating current to units requiring extremely stable voltage input.



It is stated that this unit is admirably suited for converting the fluctuating voltage obtained from commercial 115 volt, 60 cycle, alternating current circuits to a highly stabilized voltage to operate photoelectric densitometers and other similar equipment. Output power is 160 watts at 110 volts alternating current. Output voltage may be adjusted from 100 to 120 volts. Electrical regulation factor is about 1000, thus reducing a 10 volt input fluctuation to a few tenths of a volt. A frequency change in the input voltage will not vary the output voltage. Complete stability is obtained in 7 minutes. The device is 26 inches high, 19 inches wide and 22 inches deep. Total weight 100 pounds.

Air Duct: E. I. DuPont de Nemours & Co., Inc., Wilmington, Del., has developed a new type portable air duct, flexible but not collapsible, designed primarily for shipbuilding use but also suitable for other industrial applications. The new tube is a sleeve of impregnated

(*Continued on page* 162)



ENGINES, arms, projectiles, armor—almost all military equipment is now made of alloy steels, and the use of alloying materials has been greatly economized without sacrifice of quality by the addition of Boron.

Implements of peace also—machinery, tools, containers, structural parts—are and will be in growing measure made strong and durable by improvement of the steels and irons that go into them; and again the improvement will be economically brought about by aid of such hardening agents as Boron. Available supplies are adequate. The percentages that give best results are almost incredibly small. The Molybdenum Corporation has developed a ferro-boron that dissolves easily in molten metal and yields a high recovery.

Inquiries concerning any use of **Molybdenum**, Tungsten, or Boron will be welcomed.

AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.
Works: Washington, Pa.; York, Pa.
Mines: Questa, N. M.; Yucca, Ariz., Urad, Colo.

MOLYBDENUM **CORPORATION OF AMERICA**
GRANT BUILDING **PITTSBURGH, PA.**

MCA

WE AGREE

Your job is different

. . . but not too difficult for Cortland. It's just a matter of the right wheel for the right job . . . and Cortland has Snagging Wheels in all types and sizes, for operation on floor stands, portable grinders and swing frames.

All Cortland Wheels give outstanding performance — and a wheel specified by Cortland Engineers should give you rapid stock removal — longer wheel life — cooler grinding action.

Cortland Vitrified Bonded Grinding Wheels for speeds up to 6,500 S.F.M. . . . Resinoid Bonded up to 9,500 S.F.M.

For Better Snagging

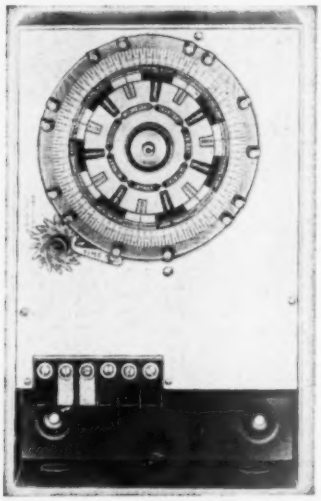
Write to CORTLAND GRINDING WHEELS CORP., 6 Cortland Street, Chester, Massachusetts

CORTLAND

(*Continued from page* 160)

cloth, either regular or fire resistant, with a tempered steel helical spring on the inside. Maximum air flow is maintained, regardless of whether the duct is bent sharply or the system is blowing or sucking air. The high grade abrasion resistant cloth is impermeable to air, and resistant to water, heat, moisture, mildew and dry rot. If necessary, it can be repaired like an automobile inner tube.

Time Switch: Paragon Electric Co., 39 West Van Buren Street, Chicago 5, announces a 7-day calendar dial time switch for timing automatic heat, ventilating, lighting, pumping, or flushing



operations. Switches are equipped with 6-inch calendar dials which make one complete revolution in 7 days. Dial trippers can be set independently for different daily On and Off schedules. Settings may be made in advance for an entire week. Certain day's operations may be omitted on a pre-set program.

Open-Hearth Gun: Illinois Clay Products Co., 608 South Dearborn Street, Chicago 5, has designed a new gun to speed up the sealing and insulat-

ing of open-hearth furnace walls and bulkheads. The gun siphons dry material direct from shipping cartons, mixes with water and sprays on the refractory wall in one operation. Premixing is eliminated. It is claimed that application is six to eight times faster

(*Continued on page* 164)

Remember . . . . . .

ECP, even it it were so inclined, has no need to urge **one** bonding clay for ***all*** purposes, because the ECP line contains five distinct clays, each with its own characteristics. So, without bias and after 20 years' experience, we make these statements: . . . . . .

1: REVIVO = ECONOMY

2: REVIVO is the Most Popular Bonding Clay in America

QUESTION: Does the first statement explain the second?

Revivo Bond is known as the "strongest of the fire clay binders". No other clay equals it in durability. It has high permeability and high flowability. Its moisture range is wide. Moreover:

Revivo Bond is more refractory, has a higher sintering point and lower contraction than any other bonding clay of any type.

"But," you may say, "these are not the qualities I need." Quite possible, for no one bonding clay can do all foundry jobs equally well. ECP offers you five products in all (see list below), which, with their many combinations, assure you of the ***most bonding strength per dollar.*** ECP engineers will be glad to advise with you without cost or obligation.

Five bonding clays — five bulletins — which may we send you?

EASTERN CLAY PRODUCTS, INC., EIFORT, OHIO

ECP

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

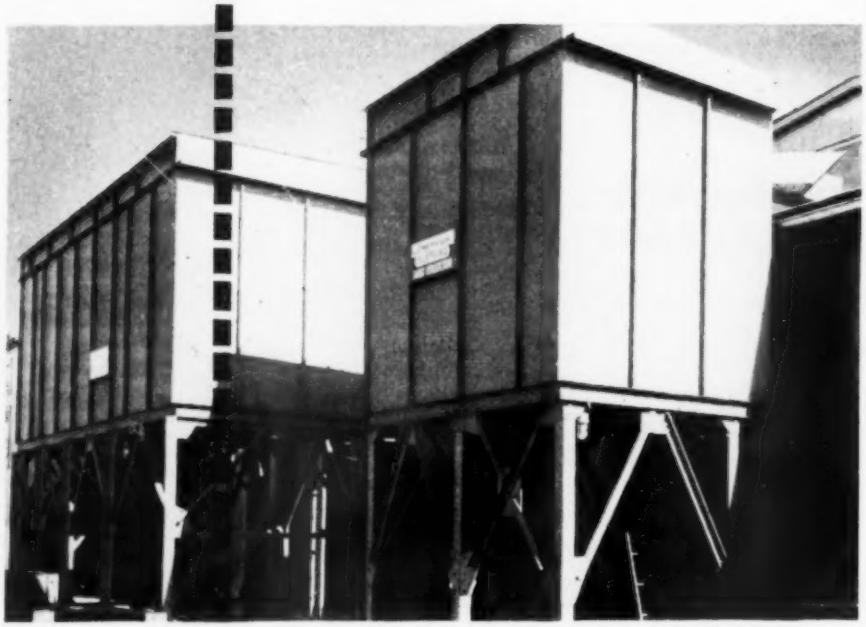
All **TYPES OF BONDING CLAYS**

A Foundry Sand Service Based Upon Practical Research

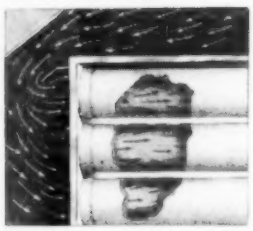
EFFICIENCY LIKE THIS

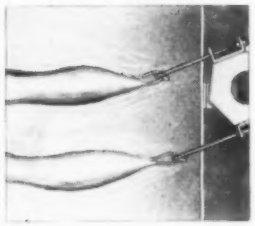
DUST-FREE GRINDING—Complete Dustube dust control installed in the new grinding room at The Lodge & Shipley Machine Tool Co. has provided dust-free grinding operations. Each grinding booth is equipped with its own Dustube and the high efficiency in which all dust is exhausted eliminates the need of respirators by the operators during routine grinding.

Ventilation of the booths is provided by exhausting dust-laden air at rates up to 15500 CFM through perforations in the floor and through a hood at the back of the booth.



CALLS FOR ENGINEERING LIKE THIS





HIGH EFFICIENCY—Extremely fine dust particles, particularly those within the low micron range are trapped in the new Dustube by nearly 100% efficiency by weight.

SHAKING DEVICE—Accumulated dust on tube is completely removed by the whipping motion imparted by the shaking mechanism when the tubes are deflated.

Send your dust-collecting problems to our experienced engineers!

American Foundry Equipment Co.
505 S. Byrkit Street
Mishawaka, Indiana

ARMY E NAVY

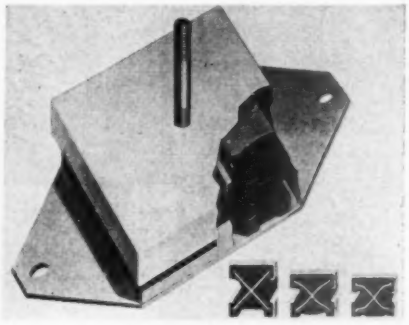
AMERICAN dustube dust collectors

(*Continued from page* 162)

than by manual method. The 4-pound gun operates on standard air and water pressures. The unit is shipped complete with 15-foot sections of air, water and vacuum hose and all necessary valves and fittings.

Controller: Bristol Co., Waterbury 91, Conn., announces a new electronic-type controller for recording or indicating automatic control of temperature, pressure, liquid level and humidity. The new controller for temperature is offered in ranges from −125 degrees Fahr. to −1000 degrees Fahr. for use with motor and solenoid valves, relays, main line switches, and other fuel control apparatus. The pressure controller is available in ranges from full vacuum to 6000 pounds per square inch and also is available for automatically controlling liquid level.

Vibration Mount: Hamilton Kent Mfg. Co., unit of U. S. Stoneware, Akron, O., announces a new type of vibration mount characterized by simplicity in design and application. De-



sign combines the high vibration dampening properties of rubber loaded in shear with the safety, durability and ease of installation of a simple compression mount. Each mount consists of one, two or more *X*-shaped rubber elements inserted in steel retaining channels, encased in a protective metal cover.

Apron: B. F. Goodrich Co., Akron, O., is offering lightweight laboratory and industrial aprons made with high grade cotton fabric and a vinyl resin coating which makes them waterproof, acid and alkali proof, and oil and grease resistant. They are made in two sizes, 35 inches wide by 45 inches long, and 29 inches wide by 35 inches long.

Program Timer: Zenith Electric Co., 152 West Walton Street, Chicago 10, announces a new program timer of simple, compact construction, and synchronous motored for the greatest possible accuracy of signals at any 5-minute period in a 24-hour schedule. The program mechanism is set automatically by turning the minute hand

(*Concluded on page* 166)

The metallurgists and technicians in the plants of Michigan Smelting are constantly searching for ways and means to improve the quality of our ingot.

In our laboratories and smelting rooms are the latest, most modern laboratory and production controls—assuring that the ingot you receive, will meet your specifications.

As new methods—new equipment are developed—that will enable us to do even better than our present best—you will find their adoption in Michigan Smelting plants.

MICHIGAN SMELTING & REFINING

BUY WAR BONDS

Division of BOHN ALUMINUM & BRASS CORPORATION, DETROIT 26, MICH.

General Offices—Lafayette Bldg.

REFINERS OF NON-FERROUS SCRAP METALS FOR OVER FIFTY YEARS

HAUSFELD FURNACES

FOR "ALL-OUT" PRODUCTION IN NON-FERROUS FOUNDRIES

Provide the Utmost in Speed Production and Safety

FURNACES FOR
BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

(*Concluded from page* 164)

as on an ordinary clock. The schedule easily may be changed at any time without the use of tools. Small brass spring clips are inserted in slots of progress disk for the desired program. Operation is by a set of cam operated contacts.

Drawing Board: Engineering Mfg. Co., Sheboygan, Wis., announces a three-way adjustable, revolving drawing board on a base adjustable to the angle, height and working position desired. The board swivels on a steel center pin. Special friction inserts assure position at any point. A steel bracket gives positive adjustment and locking to the required work angle. A special spring action clamp permits a shifting range of 8½ inches up or down of the table on the base. The entire unit folds compactly for easy portability.

Electrode Holder: Hollup Corp. Division of National Cylinder Gas Co., 205 West Wacker Drive, Chicago 6, has developed an electrode holder which enables the welding operator to use the electrode up to the uncoated end of the rod. Only ½-inch is needed for a tight current contact in the holder jaw. An extension of the holder allows the usable stub to be projected into proper position for welding. The new holder, completely insulated, may be loaded or unloaded almost instantly and because of its light weight and good balance minimizes operator fatigue.

OBITUARY

WALTER G. JONES, 63, plant superintendent of International Heater Co., Utica, N. Y., for over 30 years, died Sept. 26 at his home in that city. Born in Utica and educated in the public schools there, Mr. Jones had been with International Heater Co. since 1899, and was a director of the company at the time of his death. He was widely known among foundrymen of New York state and was a charter member of the Central New York Chapter of the A.F.A.

• • •

William E. Treat, 80, associated with the C. A. Treat Mfg. Co., Hannibal, Mo., until it was sold in 1913, died Oct. 19 at his home in that city. Mr. Treat was the son of the founder of the company, which was a well known manufacturer of car wheels and castings. He was the last member of the original company.

• • •

Charles Campbell Worthington, 90, formerly president of International Steam Pump Co., and the Henry H. Worthington Corp., now Worthington Pump & Machinery Corp., Harrison, N. J., died Oct. 21 in Washington.

• • •

Lloyd Brown, 68, president of Duplex Mfg. & Foundry Co., Elyria, O., died Oct. 25 at his home in Lakewood, O. A native of Boston, he was graduated from Brown University in 1899, and in

(*Concluded on page* 170)

Abrasive and Mandrel Wedded for Life

Mandrels of Blue Flash Mounted Wheels and Points retain their grip until the abrasive is completely used — so you get *all* the grinding you pay for. A special method of knurling the mandrel, and then cementing, guards against loosening, despite hard service. Furthermore, the Bay State *extra* is to size and shape *on the mandrel*, which automatically provides a positive test for adhesion of abrasive to mandrel.

A unique and improved manufacturing method by which each shape is accurately formed from a large blank, insures that the abrasive is uniform and consistent right down to the mandrel. Such consistency is maintained even in smallest sizes.

Give Blue Flash Mounted Wheels and Points a trial. You'll find they need no breaking-in period, will run absolutely true, have no hard and soft spots to give trouble, and can be used right down to the mandrel.

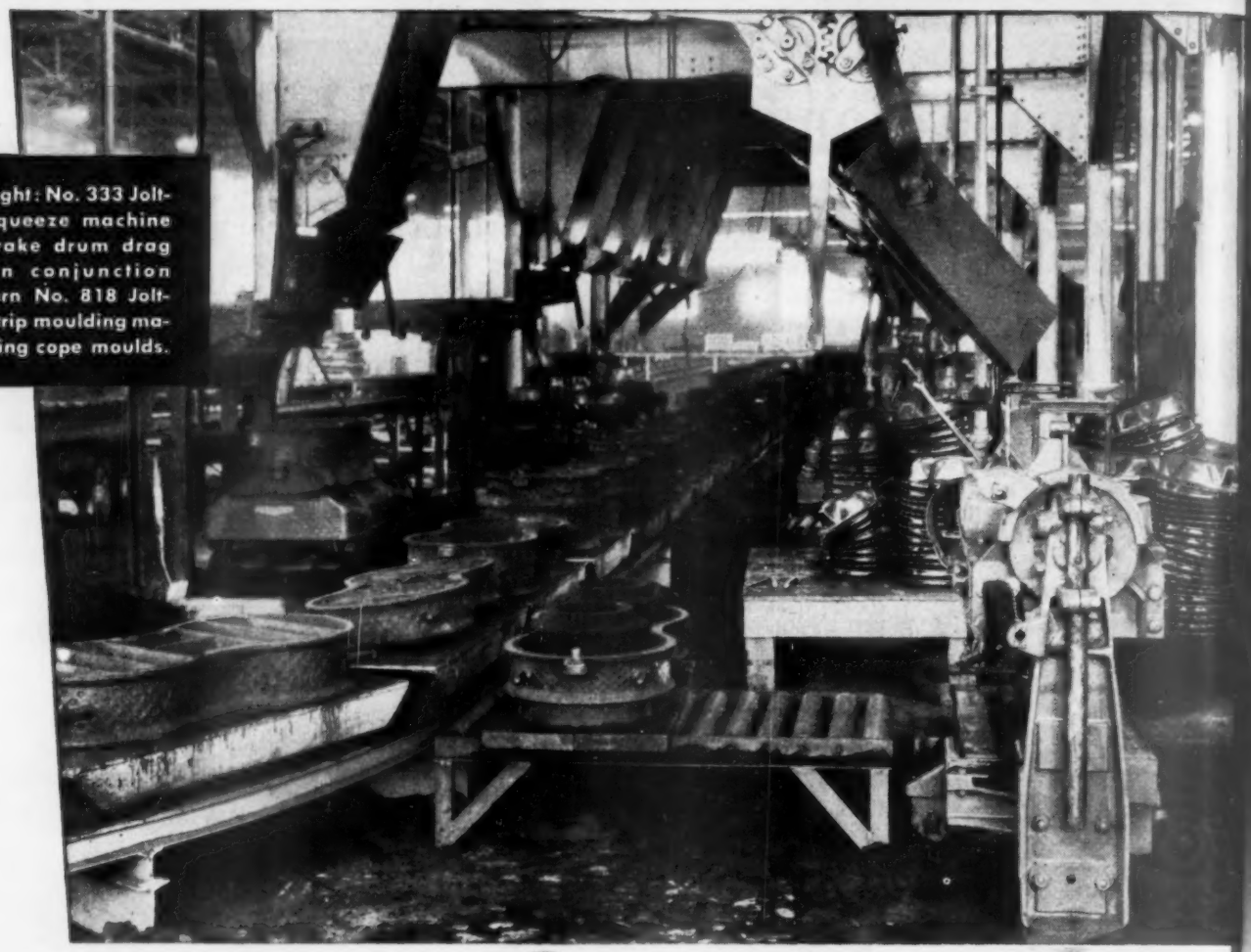
Just such features as these have made the complete line of Bay State Blue Flash Grinding Wheels first choice in a great many plants.

Write for helpful literature on the products you use, including a copy of Bay State's handy, pocket-sized catalog on Blue Flash Mounted Wheels and Points.

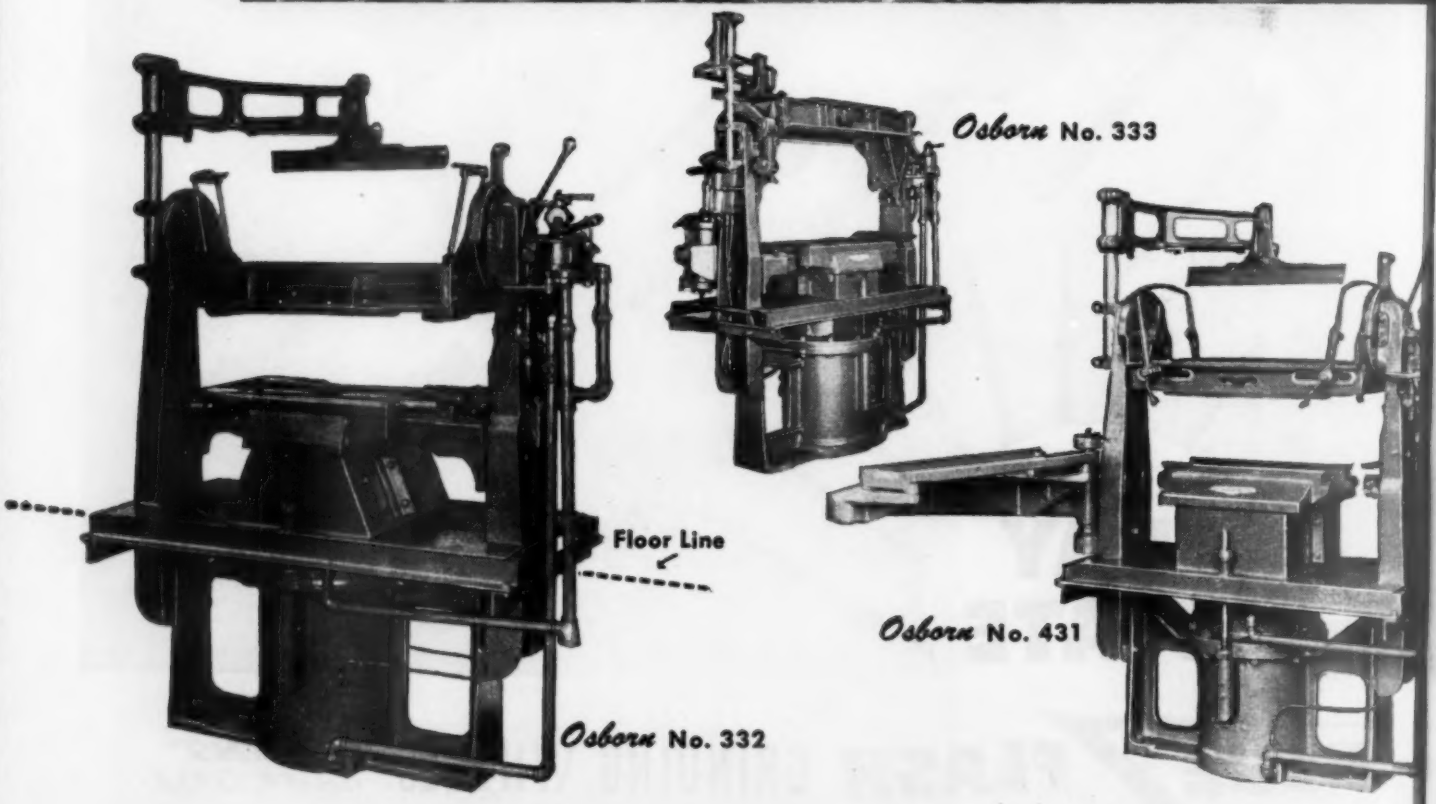
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS



Illustrated right: No. 333 Jolt-Rollover-Squeeze machine making brake drum drag moulds in conjunction with Osborn No. 818 Jolt-Squeeze-Strip moulding machine making cope moulds.



THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

HAVE YOU SEEN OSBORN'S

Improved

JOLT-ROLLOVER-SQUEEZE

MOULDING MACHINES?

OSBORN is the leading manufacturer of Jolt-Rollover-Squeeze-Pattern Draw moulding machines—especially designed for foundries which require high, sustained speed and accuracy in the production of drag moulds which must be rolled over before drawing.

We've been making these machines for years—and have been improving them all along to increase efficiency of operation and reduce maintenance cost. Improved sand shielding, for instance, to protect the jolting mechanism; above-floor force feed lubrication system which eliminates crawling into the pit; and quick-acting air clamps which are standard equipment of all larger machines.

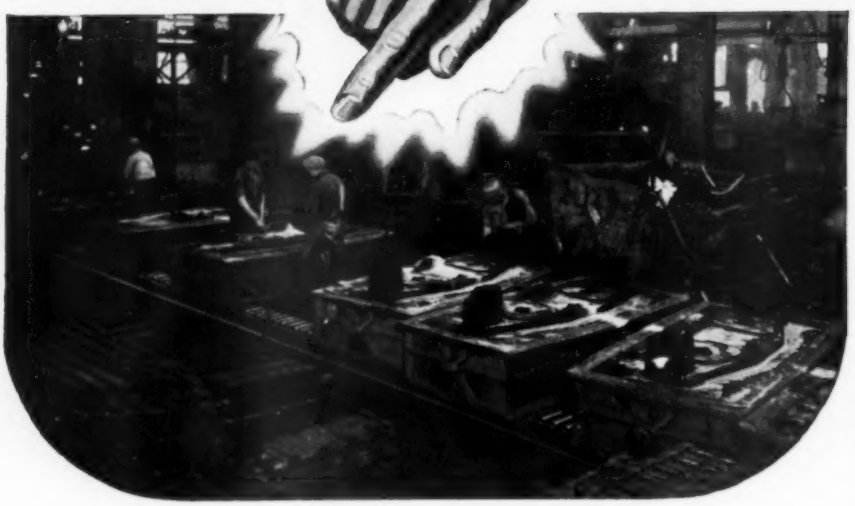
Power Rollover equipment is standard on No. 333—can be furnished as additional equipment on No. 332. (No. 332 machines being made currently can have the Power Rollover feature added at any time.)

Improved Osborn Jolt-Rollover-Squeeze-Pattern Draw moulding machines are available with 2 types of mould discharges—roller conveyor or swing frame.

OSBORN

MOULDING MACHINES

Postwar PRODUCTION STRATEGY BEGINS HERE!



The costs of material handling are known to be excessive—they add to the price of the finished product but contribute nothing to its sales value. Cut these costs and you gain a tremendously important competitive advantage.

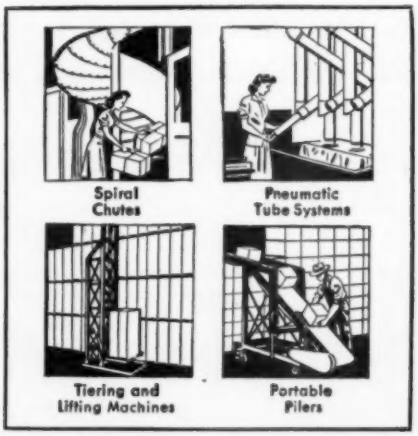
Conveyors and conveyor systems, adapted to your particular operations, speed up material and commodity handling activities, pull handling costs down to an economical level, speed the flow and movements of production. Conveyors handle a wide range of commodities — parts, packages, units, cartons, cans, bottles, barrels, bundles, drums, boxes. They are built in light, average, or heavy-duty types for either portable or stationary use—in a wide variety of sizes, styles and lengths.

Standard builds roller, belt, chain, slat, push bar conveyors; spiral chutes, tiering and lifting machines, portable pilers, and pneumatic tube systems, for every type of material handling and is equipped by experience and facilities to reduce your handling costs with the right type of equipment. Get the profitable answer to your material handling problem today. Write us for Bulletin No. F-124

STANDARD CONVEYOR CO.

General Offices: North St. Paul, Minn.

Sales and Service in Principal Cities



(*Concluded from page* 166)

1905 he became associated with the Lakewood Engineering Co., Cleveland. He was president of the company from 1921 to 1931, when he bought the Duplex company, a subsidiary of Lakewood Engineering Co., and served as its president until his death.

• • •

Joseph C. Brauer, 51, a member of the board of directors of Ampco Metal Co. Inc., Milwaukee, died Oct. 24 at his home in Wauwatosa, Wis. Born and educated in Milwaukee, in 1916 he founded the accounting firm there which bears his name.

• • •

Walter J. Krause, electrical engineer, Ohio Electric Mfg. Co., Cleveland, died Nov. 9. He gained his initial experience in the design of electric motors with Emerson Electric Co., St. Louis, prior to joining Ohio Electric Mfg. Co. in 1919.

• • •

Pvt. Joel Heysel, 18, formerly connected with Bison Castings Inc., Buffalo, was accidentally killed Oct. 30 during maneuvers while stationed at Camp Van Dorn, Miss. He was a son of A. J. Heysel, E. J. Woodison Co., Buffalo.

• • •

Walter J. Adams, 79, a foundry supply salesman for 50 years, died Oct. 15 in Milwaukee. He had been employed by the Donald Sales & Mfg. Co. for ten years until illness forced his retirement two years ago.

• • •

Fred H. Clausen, 68, president of the Van Brunt Mfg. Co., Horicon, Wis., subsidiary of Deere & Co., and vice president of the Chamber of Commerce of the United States, died Oct. 20 at Green Lake, Wis.

• • •

Thomas P. Anthony, 65, consulting engineer and former chief engineer of United States Pipe & Foundry Co., Burlington, N. J., died Oct. 7 at his home in Edgewater Park, N. J.

• • •

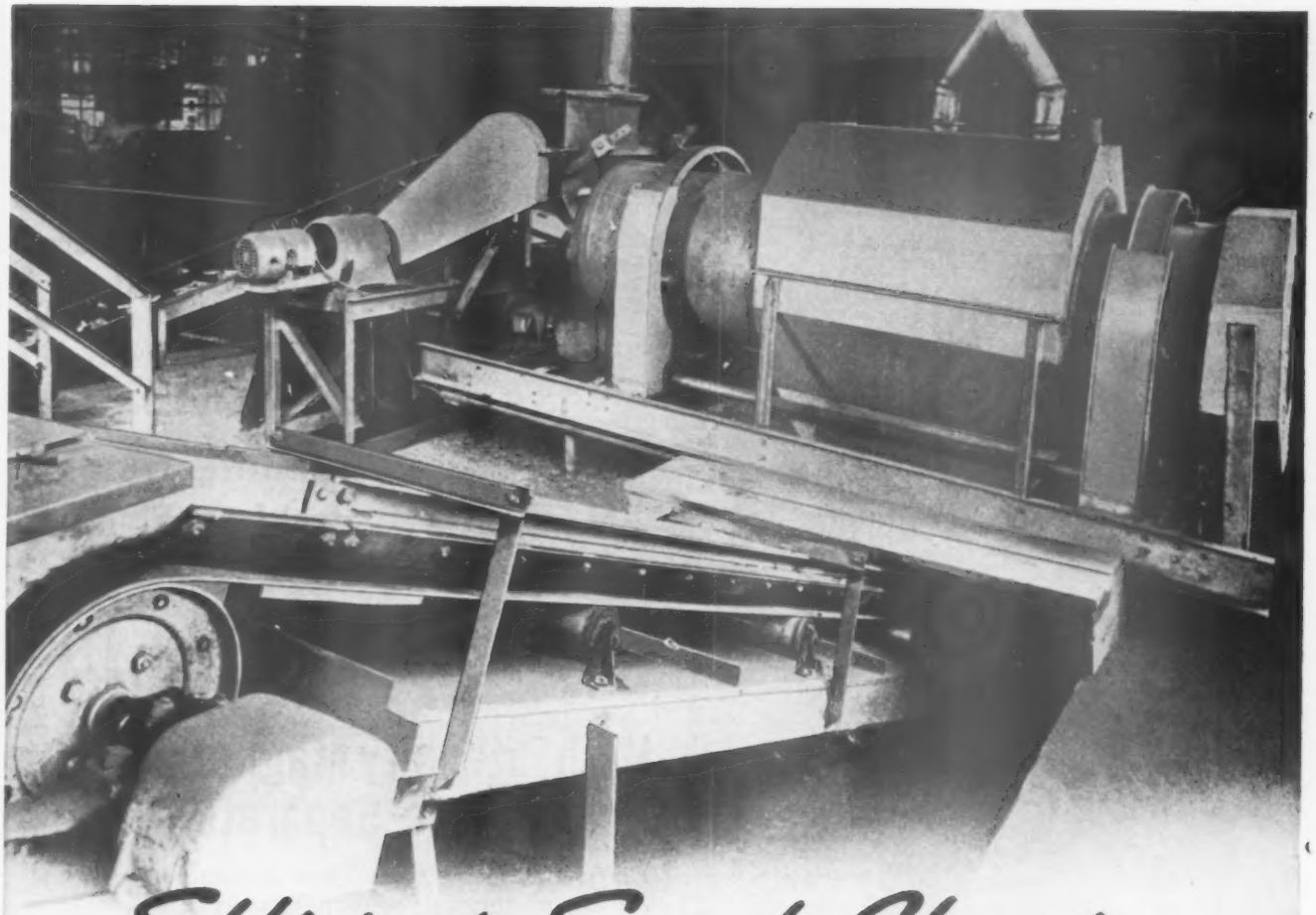
Charles Swiebel, 69, formerly part owner of Redding Iron Works, Redding, Calif., died Oct. 3 in that city.

• • •

Joseph W. Sullivan, 73, founder and chairman, Skilsaw Inc., Chicago, died Oct. 26 in Evanston, Ill.

City Pattern Wins Army-Navy "E"

City Pattern Foundry & Machine Co., Detroit, was awarded the Army-Navy "E" at plant ceremonies Oct. 26. Vaughan Reid, president, accepted the pennant from Col. George E. Strong, Army Air Corps. "E" pins were presented by Capt. Robert Velz, U. S. Navy, and accepted on behalf of the employes by Walter Rautenberg, pattern division, Pete Brancovan, machine division, and John Angel, foundry division.



Efficient Sand Cleaning
is important in small foundries too!

● Fully housed in and vented to a dust collector, this revolving breaker screen in a small steel foundry, cleans up to 30 tons of sand per hour, with almost no dust loss at all. Flights, on the inside of the unhooded breaker section, lift the sand and drop it down on a solid plate, breaking up the lumps, before the sand passes to the wire mesh screening section. Sprues, gaggers, rods and hard-baked lumps are discharged at the end.

Bartlett-Snow Revolving Breaker Screens can handle dry, hot, cold or any intermediate condition of sand,—range from 30″ to 84″ in diameter. They meet all requirements for on-the-floor or overhead mounting — and are installed usually with magnetic pulleys which are placed either before or after the screen, depending upon conditions.

Our recently issued 40-page Bulletin No. 91 which illustrates many different arrangements of revolving and vibrating screens,—and other Bartlett-Snow Foundry Equipment—will be of great interest to every foundryman. Send for a copy!

THE C. O. BARTLETT & SNOW CO.

6201 HARVARD AVENUE • CLEVELAND, OHIO

Engineering and Sales Representatives in the Principal Cities

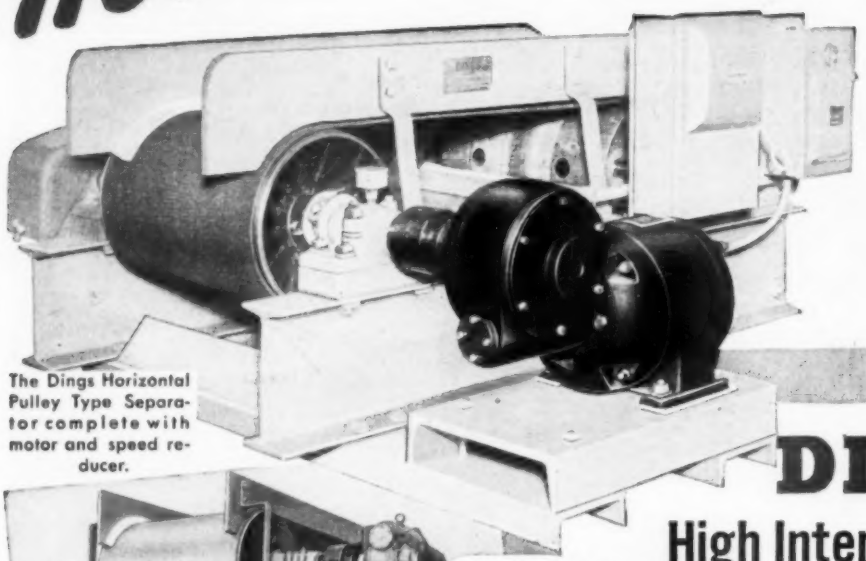
FOUNDRY SAND, MOLD AND CASTINGS HANDLING • • DUST AND FUME CONTROL SYSTEMS • •

Here's FLEXIBILITY for

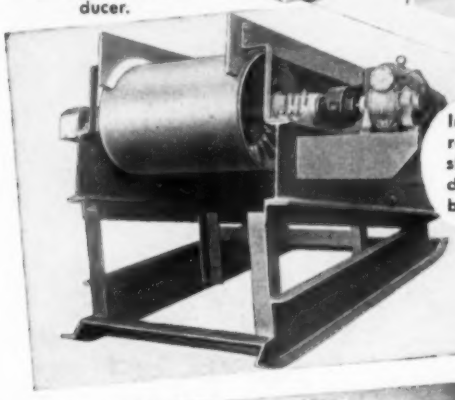
Removing Iron from Foundry Sand

Separating Ferrous & Non-Ferrous Scrap

Reclaiming Iron & Steel from Slag

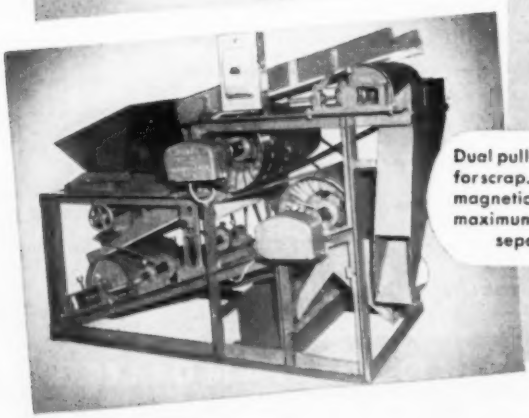


The Dings Horizontal Pulley Type Separator complete with motor and speed reducer.



Inclined Separator for reclaiming iron and steel from slag. Skids designed so unit may be dragged by tractor.

Portable inclined unit mounted on casters for separating ferrous and non-ferrous scrap. Note receptacle for iron.



Dual pulley separator for scrap. Employs two magnetic pulleys for maximum clean cut separation.

DINGS

High Intensity Magnetic Pulley Type Separators

Dings Magnetic Pulley Type Separators are completely self-contained units consisting of magnetic pulley, idler pulley, endless belt, frame, accessories, etc. They are available in horizontal or inclined, portable or stationery models for use with existing conveyor installations or as independent units.

Widely used throughout the metal working industries, they offer high capacity, dependability, economy of operation and great flexibility to meet widely varying requirements.

Dings High Intensity Magnetic Pulleys and Pulley Type Separators are described fully in catalog No. 250 which includes specifications, capacities and other data.

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Dings Magnetic Separator Company

512 East Smith Street, Milwaukee, Wisconsin

Alnico Horsehoe Magnet. 2½ in. high, 3 in. wide. ¾ in. x ¾ in. poles. Very powerful. Prices on request.

Dings MAGNETIC SEPARATION HIGH INTENSITY

Readers' Comment

(*Continued from page* 122)

used. The mention of having college training was counted as a debit in every case tried.

Lest the wrong idea be gained, let me explain further. The list did not contain every foundry in Chicago. Many of them are progressive enough to capitalize on college men. This list did contain all the jobbing foundries in a given area. Furthermore, it included ferrous and nonferrous foundries. As for myself, I was seeking a position where my training and background could be put to use. I fully realized that I had much to learn and was willing to do so.

This situation is not healthy. On one hand we have the college-trained man spurning the foundry. On the other hand, we see the foundryman rejecting the college man. An article appearing in a previous issue of THE FOUNDRY, discussed the reasons why college men did not choose the foundry as a profession. The article also carried recommendations for correcting this evil. But, why does the foundryman reject a college man? Part of this is due to resentment. Most of the local foundrymen are self-made men. They gained their knowledge through trial and error over a long period of time. They gained a place in the sun through the sweat of their brow. They struggled through the depression. At the same time, newspapers carried stories of college students doing asinine stunts at certain universities. The foundryman, like many other people, began to resent anyone connected with colleges. The newspapers did not carry stories about students who worked their way through college. Nor did they mention the engineering student whose hours were similar to the foundryman's.

It is necessary then to correct this situation. The best way is to make the foundryman conscious of college training. The college or university has an obligation to fulfill here. A glance at a catalogue of an engineering school will reveal a strange fact. Only in isolated cases do you find a foundryman among the advisors. Executives of almost every other industry seem to be preferred. This may be caused by the fact that most engineering schools do not place enough emphasis on foundry practice. Regardless, representatives of the foundry industry should be on the board of the engineering school. The more one participates in an activity, the more he will gain therefrom. This should be borne in mind when vacancies are to be filled on the college advisory staff.

Students from local engineering schools should be encouraged to attend A.F.A. meetings. Not only can they learn some of the basic principles of foundry practice, but, they can also observe the foundry industry in operation. This is where the foundryman benefits. A student who is interested enough to come out to several meetings is a potential foundryman. To further the cause, a student's night can be arranged. This idea was

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Here is an illustration of a Schramm Compressor, furnishing air in a modern plant, one of many now using Schramm.

Schramm Compressors are specified because they do a *variety* of jobs, give you all the air you want, and are economical to run.

Note these uses where Power Plants require Schramm: operating milling and drilling machines . . . chipping and calking hammers . . . cleaning engines and generators . . . sand blasting . . . grooving bearings . . . cleaning boiler flues . . . and every other pneumatic tool requirement.

For full details, giving advantages of Schramm, and reasons why *they are superior, write today for Bulletin IND-44.*

SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

tried successfully by another society. Some of the students participating in the program were made offers of positions when the members present realized their ability. Last, but not least, the foundryman should meet the student informally. Both parties will discover that the other fellow is pretty good.

Any plan is doomed to failure unless co-operation is complete. The foundryman must be open-minded. He must judge the college man on the basis of what he does and not upon prejudices. It is true, most college men do not have any practical experience. But, they have the ability to learn and apply what they have learned. That is why those college men who have entered the foundry industry and worked hard are highly successful. The man entering a foundry fresh out of school must be oriented. He will be awkward at first and make mistakes. But, given a chance, he will likely prove to be a good bargain. The addition of a college man to the staff tends to keep the personnel on their toes. Again, the responsibility falls on the foundryman. He must introduce the college man into the organization in such a manner that the other employes will not resent his entrance.

Under proper conditions, the college graduate will enter the foundry. His entry into the industry can only be made possible by education. The college man must be shown that there are opportunities for him, and the foundryman must be convinced that all college men are not smart aleck kids. The entire problem is a function of the three I's: Individual, industry, and institution. The blame for the failure of college men to enter the foundry industry must be leveled equally at all three.

ROBERT E. WICK
915 *North Drake Avenue*
Chicago, 51.

Stirring Rods

TO THE EDITORS:

In the August, 1944 issue of THE FOUNDRY on page 95 there is a short discussion on the use of stirring rods.

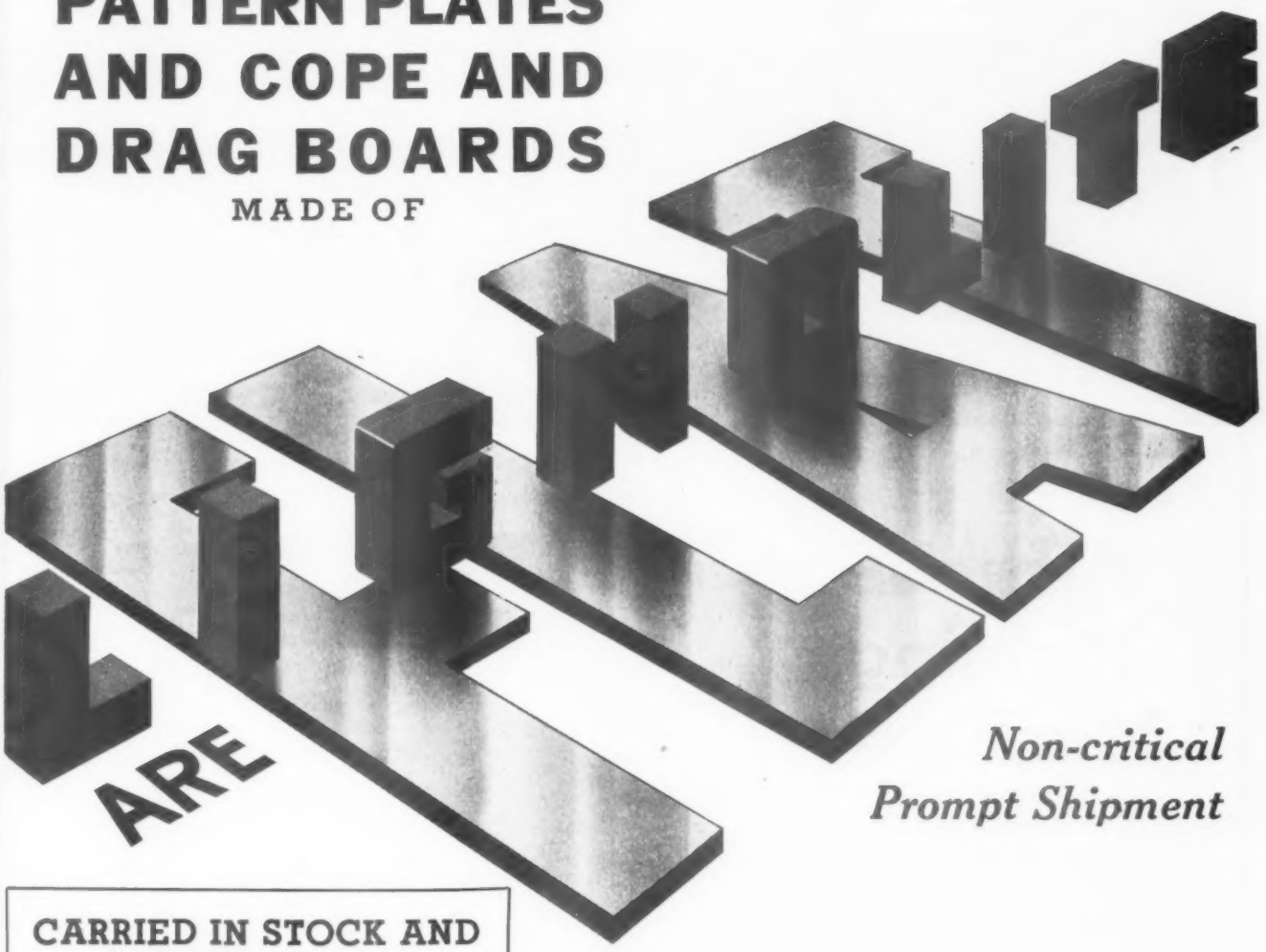
Metal rods have been used and because of the greater strength factor in the metal rod over graphite it will withstand more mechanical shock than graphite if both rods are the same size. If you change the design slightly to compensate for graphite's relatively weaker structure, you will find that it is possible to utilize all the advantages of graphite and it will last longer.

Instead of the ordinary rod, we would suggest the use of a flat plate of graphite, of whatever size is considered practical for your purposes, and to this graphite plate attach a metal rod or rods to be used as a handle or support. In this way the graphite plate will be stronger than the rod and will serve as a skimming board as well as a stirring rod.

V. J. NOLAN
Assistant General Sales Manager
National Carbon Co.
New York

PATTERN PLATES AND COPE AND DRAG BOARDS

MADE OF



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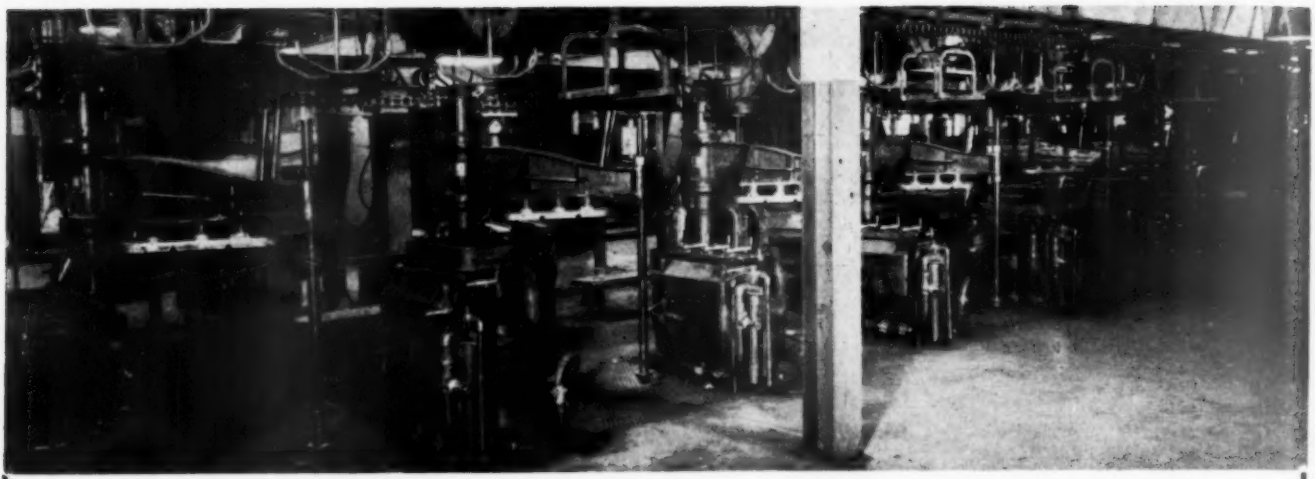
• They stay flat because LIGNOLITE has high transverse strength and resistance to deflection. It is impervious to moisture and does not warp from contact with wet sand or high humidity. LIGNOLITE is half the weight of aluminum, is abrasion proof, of uniform caliper, and may be easily machined, sawed, drilled, tapped. Available in all flask sizes 7/16″ to 2″ thick or in sheets for own cutting. Write for sample and complete information.

Mounted LIGNOLITE Pattern Plate

MARATHON CORPORATION

CHEMICAL DIVISION — **ROTHSCHILD, WISCONSIN**



A Battery of Nicholls 16' Heavy Duty Machines

Nicholls' Molding Machines

Preferred by the Largest Foundries..

REDESIGNED to a minimum of working parts; thereby greatly reducing maintenance cost and, at the same time lowering operating costs through the saving of labor. The crossarm is equipped with a parallel squeeze plate which considerably reduces the amount of crossarm travel; resulting in faster operation and less effort required. The open end frame allows for flexibility in pattern lengths. Quick acting, yet so simple to operate that unskilled labor can be taught to make molds in record time.

#18-44 Type "K" Heavy Duty Jolt Squeeze and Pattern Draw Molding Machine, with open end frame and parallel squeeze plate, 18" diameter squeeze piston and 8" diameter jolt piston.

Wm. H. Nicholls Co., Inc.

Richmond Hill, L. I., New York

We solicit your inquiries on NICHOLLS production line of molding machines.

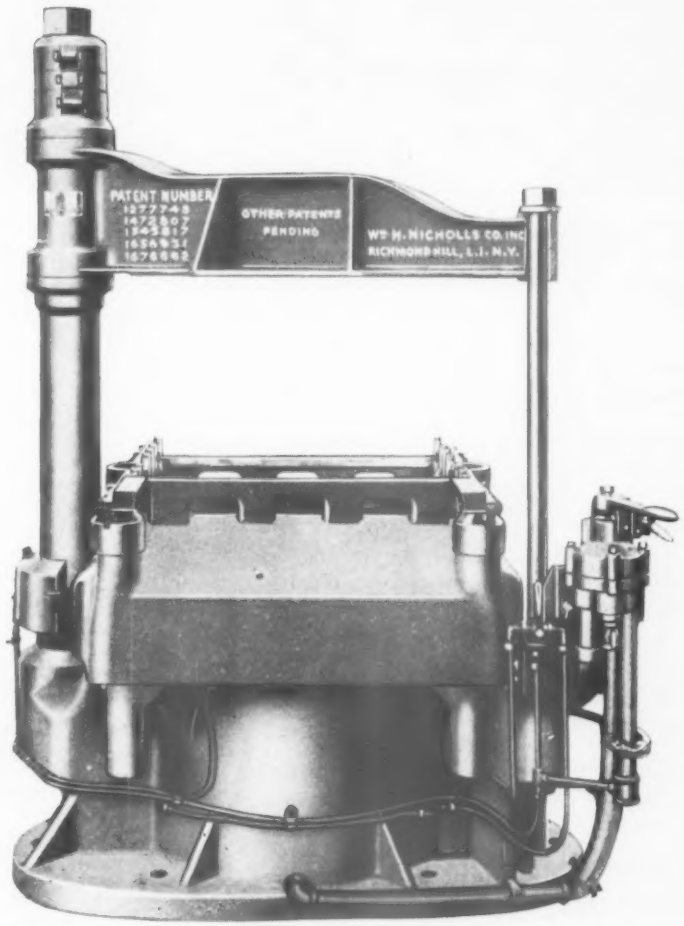
ORIGINAL IN DESIGN
STURDIEST IN CONSTRUCTION
SIMPLEST IN OPERATION
FASTEST IN PRODUCTION

Simplicity

After jolting the mold is squeezed on the upstroke of the piston—then on the downstroke, as the air exhausts, the pattern is drawn and at the same time the functioning of the rolloff takes place without any power or energy. The pattern draw and flask lift is accomplished automatically by gravity!

Construction

The machine with the least number of cylinders and working parts is what you want for best results in the foundry. Special alloy metals, many parts heat treated, all wearing parts hardened and ground, and the precision in workmanship in the finishing of these machines assure perfect alignment and draw.



#20-42 Type "D" Heavy Duty Jolt Squeezer Molding Machine with Pattern Drawing Device and Power Operated Squeeze Head. Equipped with automatic flask rolloff device, 20" diameter squeeze piston and 9" diameter jolt piston.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL, LONG ISLAND, NEW YORK
ESTABLISHED 1910

Foreign Manufacturers and Selling Agents—

For Continental Europe and Great Britain—The George Fischer Steel and Iron Works, Schaffhausen, Switzerland.

NICHOLLS

Good CUPOLA PRACTICE

Photo shows two "R-C" Rotary Positive Cupola Blowers with V-Belt drive by 4-speed motor; installed in a Southern Foundry.

Good cupola practice demands that blowers be used which are capable of delivering the maximum quantity of air that ever will be required in your foundry. They must be able to deliver this air in a positive manner and at a pressure high enough to overcome the maximum resistance that frequently develops in all cupolas.

Therefore, in conformance with good cupola practice, it is logical that you should use Roots-Connersville Rotary Positive Blowers. They have the inherent ability to build up pressures to overcome any resistance and to deliver economically maximum quantity of air to meet any condition by simply changing the speed. Their rugged construction and high quality of workmanship enables them to deliver in excess of their rated capacities for short periods, if necessary.

In addition, they are built to give years of trouble-free service. Write for Bulletin 22-B-12.

ROOTS - CONNERSVILLE BLOWER CORPORATION

One of the Dresser Industries

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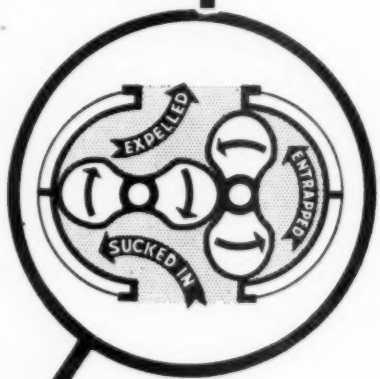


POSITIVE DISPLACEMENT

Twin impellers alternately suck in, momentarily entrap, and then expel definitely known amounts of air, resulting in positive delivery of four equal volumes each revolution of drive shaft. Impellers need no seal or lubrication. Capacity varies with speed. Pressure automatically builds up to overcome resistance on discharge side.

Roots CONNERSVILLE SINCE 1854 Positive Displacement CUPOLA BLOWERS

TEST SPECIMEN FOR NONFERROUS CASTINGS

(*Continued from page* 116)

pirical, their accuracy depends on the accuracy and reproducibility of the measurements of the properties of the material. In the ten columns tested by the Building Department of New York City, breaking loads varied from 22,700 to 40,000 pounds per square inch.

These experiments and failures led engineers to be very skeptical of all materials data and to insist on tests of the parts to be employed or of representative test coupons removed from the parts.

Unfortunately, metallurgy had not developed at this period from an art to a science. The metal producer, whether foundry or mill, with no intimate knowledge of the material being produced, was unable to advise or criticize the efforts of the engineer or scientist working on these problems. Furthermore, he was probably not even remotely interested. The engineer chose his samples more or less blindly and performed extensive experiments and devised mathematical tricks with no knowledge of whether the material was good, bad, or indifferent.

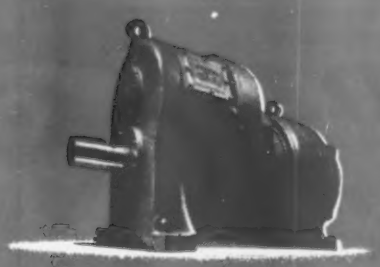
Strength Was Low

As an example, to return to studies of columns, Hodgkinson's experiments on which Gordon's formula was based, were performed on Low Moor, Yorkshire No. 3 iron, said to be good iron, not very hard, which showed a tensile strength of 14,535 pounds per square inch[3]. The lowest strength iron allowed in the first standard specifications for cast iron of the A.S.T.M. adopted in 1905 was 18,000 pounds per square inch. It would be difficult for a modern foundry to produce an iron as weak as Hodgkinson's. Had there been competent metallurgists in that day to give proper advice, much future grief would have been avoided. Actual competence was not attained until the turn of the century, but scientific control in the gray iron foundry had scarcely come twenty years later.

As with cast iron, little was known of nonferrous alloys until long after their application in engineering design. In fact, no interest was displayed in nonferrous materials by the A.S.T.M. until 1911 with the formation of Committee B-2 on Nonferrous Metals and Alloys (Committee B-5 on Copper and Copper Alloys Cast and Wrought resulted from reorganization of B-2 in 1929).

By the time of the organization of Committee B-2 the test bar situation for nonferrous alloys was rather hopelessly muddled. Each producer had his own favorite bar, if a bar was made at all. In view of the earlier history, it was natural that the consumer should want a test on a coupon taken from or cast integrally with the casting contracted for. The de-

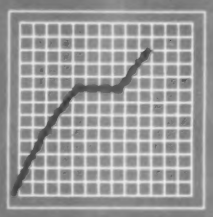
(*Continued on page* 180)



1/10 TO 100 HORSEPOWER

Five types of gearhead motors serve industries ranging up to 400%.

available in combinations of all these types



HIGH EFFICIENCY

Have efficient than other types of slow speed drives . . . only 2% power loss in each stage of reduction. In parallel shaft type.

MASTER GEARHEAD MOTORS

These are the ***good reasons why*** gearhead motors met with such immediate success when The Master Electric Company originated and pioneered the first line of gearhead motors, years ago.

These are the ***good reasons why*** more gearhead motors in use today carry the Master name than all other makes . . . COMBINED.

These are the ***good reasons why*** Máster Gearhead Motors will help you save money and still add greatly to the convenience, compactness and safety of your motor driven machinery. For best results, use them for either your plant or your products.

THE MASTER ELECTRIC COMPANY ● DAYTON 1, OHIO

PROVEN RELIABILITY

Their durability and stamina have been proven with millions of hours of service all over the world.

UNDIVIDED RESPONSIBILITY

The complete Gearhead Motor is designed and built by one manufacturer in one plant.

COMPACT

Integral, compact design saves space, saves money, improves appearance.

• Geared to the precision demands of war, Chicago Wheels have been a potent force in smashing bottlenecks—cutting down rejects—speeding production to an all-time high.

Constantly tested, constantly improved—Chicago Wheels produce finishes so perfect they pass exacting surface analyzer tests, so accurate they can be measured in micro inches.

Production of civilian goods will demand the same precision finishing methods. Keep pace with Chicagos, the Wheels of Progress!

CHICAGO GRINDING WHEELS Anything up to 3" in diameter in various grains and bonds, including FV, the sensational new bond with a pedigree.

CHICAGO MOUNTED WHEELS Shapes and abrasive formulas to take care of every job of internal or external finishing.

TRY ONE FREE! So you'll know what they can do, we will send a test wheel. Tell us material you'd like to finish and size wheel required.

Write for Catalog listing all Chicago products and showing comparative photographs of finishes with different kinds of Wheels.

CHICAGO WHEEL & MFG. CO.

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FD-12

Send Catalog. Interested in ☐ Grinding Wheels.

☐ Mounted Wheels. ☐ Send Test Wheel. Size.....

Name .....

Address .....

(*Continued from page* 178)

velopment of the new science of metallurgy went unheeded by the engineer.

Nevertheless, the foundryman was learning to control his product and to place faith in the bar he had developed on the basis of good foundry practice and good metallurgy. In many cases the consumer was well satisfied with the result. Critical discussion in the technical press pointed out the misleading results often obtained from the integrally cast bar[4]. Other work also appeared governing the design of bars, especially that of Jones[5], Karr[6], Webbert[7], and Skillman[8].

Conflict of opinion between engineer, foundryman, and metallurgist might have been eliminated at this time but for failure of manganese bronze castings and forgings at the Catskill Aqueduct in 1914. It was recognized that for this material, at least, no adequate test bar had yet been devised. This failure led to withholding of standard specifications for high-strength brass and bronze rods scheduled for completion in 1915, in discussion of which G. K. Burgess of the National Bureau of Standards remarked, "It would appear that the knowledge generally available to engineers responsible for designing structures into which nonferrous alloys enter is all too meager"[9].

Many Methods Practiced

In the period commencing around 1910 much attention was paid to the method of producing test bars, as noted above. The main points involved were: (1) the separately *versus* the integrally cast bar; (2) the machined *versus* the cast-to-size bar, and (3) the sand-cast *versus* the chill-cast bar. Many leading foundrymen were in favor of the integrally cast bar. Referring to Outerbridge's work[4] on the coupon test, Jesse Jones wrote, "It is rather gratuitous to call the integrity of such tests into question . . . ."[5]. Jones performed a number of tests on manganese bronze and "red brass" (composition not stated but presumed to be 85-5-5-5).

The test bar patterns represented those currently used by a number of leading manufacturers. Jones concluded that the best sand-cast bar was one similar to a steel coupon with a heavy over-all riser. In view of the high shrinkage of manganese bronze, this conclusion was possibly correct and the present manganese bronze specifications call for a keel block casting although the keel block specimen is at present under question, especially in England. For red brass, however, his conclusion was not borne out by his data, the best tensile strength being shown by a simple cast-to-size bar with a riser at the far end from the gate. Bars simulating integrally cast bars were generally inferior.

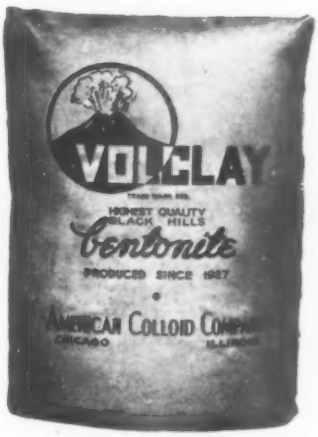
In 1914 Webbert[7] described his method of attaching test bars to a casting, the bar being cast approximately to size and attached to the casting by a thin gate the full length of the specimen as shown in Fig. 1, claiming this method

(*Continued on page* 184)

VOLCLAY BENTONITE

NEWS LETTER No. 8

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE



Western Bentonite

Southern Bentonite

WHICH TYPE OF BENTONITE FOR FOUNDRY WORK?

Two types of bentonite are used in bonding foundry molding sand. They are alike in these respects—both yield high green strength with a minimum of clay substance, high permeability and high sintering point, and both peel well.

They differ greatly in dry, hot and baked strength, in collapsibility and in endurance.

Southern bentonite has less dry, baked and hot strength than Western and collapses more readily, hence puts sands in condition to accommodate metal contraction in interior sections and when a thin metal line envelops a section of the mold. It prevents hot cracks and tears in the casting, and the sand shakes out free from lumps.

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★ ★ ★

More details on the contrast between Southern and Western Bentonite are given on Page 14 of Bulletin 223-C. *Send for it.*

Blends of Volclay and Panther Creek cannot be made at our plants because of geographic location. However, foundries are blending these Bentonites in use, with highly satisfactory results.

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10"-32" Jolt Squeezer	10"	4"	32"	
12"-38" Jolt Squeezer	12"	5"	38"	
16"-42" Jolt Squeezer	16"	6"	42"	
10"-32" Universal Jolt Squeezer	10"	4"	32"	3" to 6"
12"-38" Universal Jolt Squeezer	12"	5"	38"	3" to 6"

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Adams Molding Machines

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12" Post Type Jolt Squeezer	12"	5"	
10" Post Type Universal Jolt Squeezer	10"	4"	3" to 6"
12" Post Type Universal Jolt Squeezer	12"	5"	3" to 6"

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(*Continued from page* 180)

specially suitable for 88-10-2 castings. If the bar could be placed in the parting line, the pattern could be put on the plate. Otherwise it was a simple matter to place a suitably designed core. It is interesting to note that Webbert gave data in which for a large valve body the body wall showed a tensile strength of 25,800 pounds per square inch and an elongation in 2 inches of 13 per cent, for the flange a tensile strength of 23,650 pounds per square inch and an elongation of 11.0 per cent, and for the cast-on bar a tensile strength of 40,000 pounds per square inch and an elongation of 40 per cent. The bar could hardly be called representative of the casting.

An extensive investigation was carried out by the National Bureau of Standards in cooperation with the American Institute of Metals on the general properties of 88-10-2 with one of the purposes the establishment of a suitable standard test bar. This investigation resulted in the reports of Karr[9, 11] and Rawdon[10] to the American Institute of Metals and in the report of the National Bureau of Standards[12]. The results on test bars were not particularly conclusive and the chief outcome of the investigation was the oxidation theory of causes of porosity in bronze, since shown to be entirely erroneous.

Test Made Mandatory

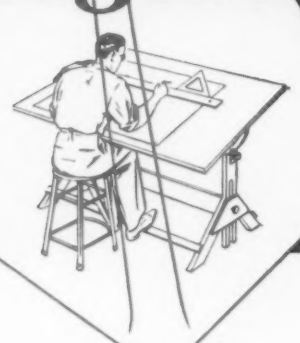
When the A.S.T.M. Tentative Specification for the Alloy: Copper, 88 per cent; Tin, 10 per cent; Zinc, 2 per cent (B 10 — 15 T)[13] were established in 1915, a bar similar to the Webbert bar shown in Fig. 2 was made mandatory for all castings on which it could be applied. On other castings the method of test bar production was as agreed to by producer and purchaser. The specifications were adopted as standard in 1918 (B 10 — 18)[14].

That the Webbert bar was not entirely satisfactory is evidenced by the fact that the whole test bar question was again reviewed by Subcommittee III on Sand-Cast Metals and Alloys of the A.S.T.M. Committee B-2 on Nonferrous Metals and Alloys in 1922[15] and much experimental work was done on a bar corresponding in its general features to that now known as the Crown bar, with thin gates along the length of the grips but leaving the gage length free, unlike the Webbert bar with its fin-gate the whole length. No report was made of the data obtained on these cooperative investigations but note of the progress of the work was taken by Jones in discussion of Dix's paper on nonferrous specimens[16] that at that time chief attention was being given to the bar of the Crown type attached to a *flat* reservoir plate.

Whatever the verdict of the investigating committee, when A.S.T.M. Tentative Specifications for 88-8-4 Copper-Tin-Zinc Alloy: (B60 — 26 T)[17], Steam Bronze (B 61 — 26 T)[18], and Composition Brass (B 62 — 26 T)[19] were proposed, the bar described in B 10 — 18

(*Continued on page* 186)

ALUMINUM new designs



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(*Continued from page* 184)

was modified to the extent of adding a plate approximately 1 x 4 x 6 inches to which the bar was attached throughout its length by a fin-gate ⅞ inch thick as shown in Fig. 3. The fin-gate on the B 10 — 18 bar was ⅛ inch thick and ½ inch wide at the grips, the width not being specified in the new pattern until 1941. Whether there was complete faith in this new pattern cannot be stated, but suffice it to say no change was made in the B 10 — 18 pattern until 1934 when these specifications were withdrawn as being covered by Specifications B 60 — 28[20].

An interesting point develops in examining requirements of A.S.T.M. Specifications B 10 and B 60, B 61, B 62. The Webbert bar of B 10 — 18 was required to be an integral part of all castings to which it could be applied. The modified bar with plate attached of the later specifications B 60, B 61, and B 62 was mandatory until 1941 when the sense was changed to recommended. In a casting to which it was practicable to attach a bar, according to the requirement of the specifications, not only the bar but its accompanying plate had to be attached.

Prescribe Gating System

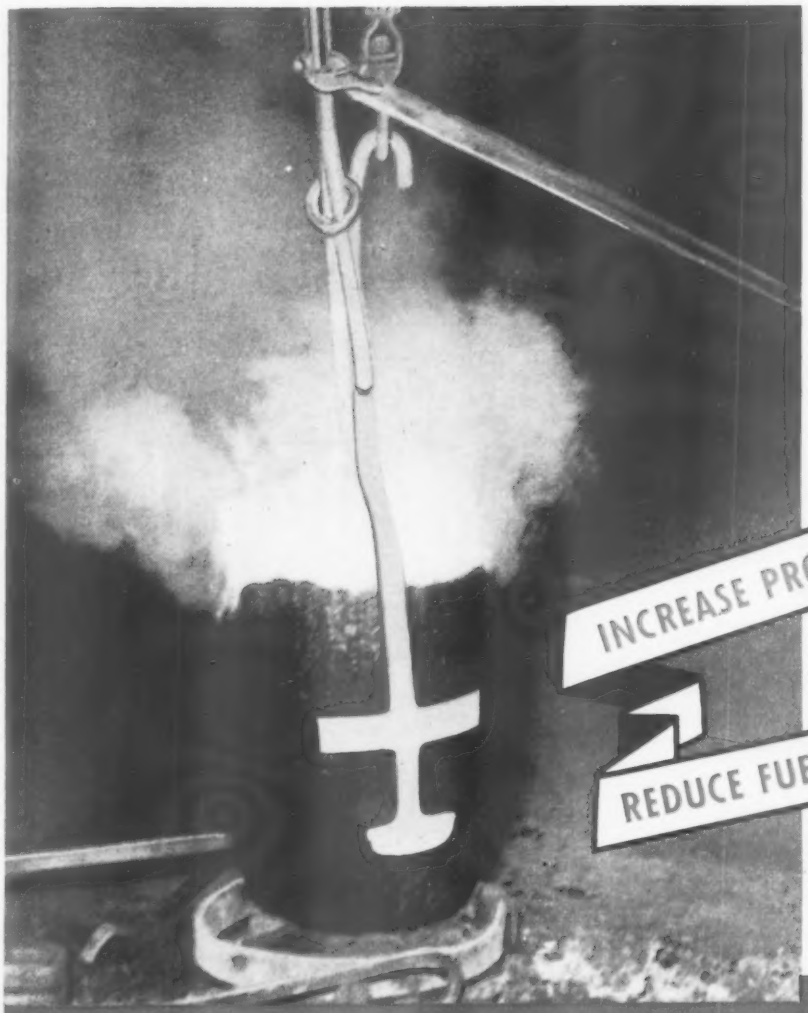
No method of gating is prescribed in A.S.T.M. specifications but in U. S. Federal Specification QQ-M-151a the gating is clearly prescribed. From this provision it is obvious that the test bar is no more representative of the casting to which it is attached than if it were cast separately. The new A.S.T.M. tentative specifications which replace the earlier B 60, B 61, and B 62, namely A.S.T.M. Tentative Specifications for Tin-Bronze Castings (B 143 — 42 T)[21], and for Leaded Red Brass (B 145 — 42 T)[22], and also others in which this same test bar is recommended, namely, A.S.T.M. Tentative Specifications for High-Leaded Tin-Bronze (B 144 — 42 T)[23], for leaded Yellow Brass (B 146 — 42 T)[24], and for Leaded Nickel-Brass (B 149 — 42 T)[25], omit all reference to attachment of the bar to the castings.

From a co-operative research investigation of the Nonferrous Ingot Metal Institute and the National Bureau of Standards commencing in 1930, Gardner and Saeger[26] reported that the fin-gate type bar of A.S.T.M. specifications showed adverse structural development as a result of the fin-gate and over-all riser with a consequent lack of uniformity in physical properties. This report showed better properties in a cast-to-size bar with a single riser at the far end from the sprue, described a year earlier by Parsons[27]. Of interest was a remark in discussion of Parson's paper by St. John: "The whole matter of test bars, it appears to me, is one which should receive a thorough housecleaning. I do not know who should do it but it is overdue." One is reminded of Mark Twain's comment on the weather, that people are always talking about it but no one ever does anything about it.

REFERENCES

1. Attention is called to the work of a special committee of the Franklin Institute on the

(*Concluded on page* 190)



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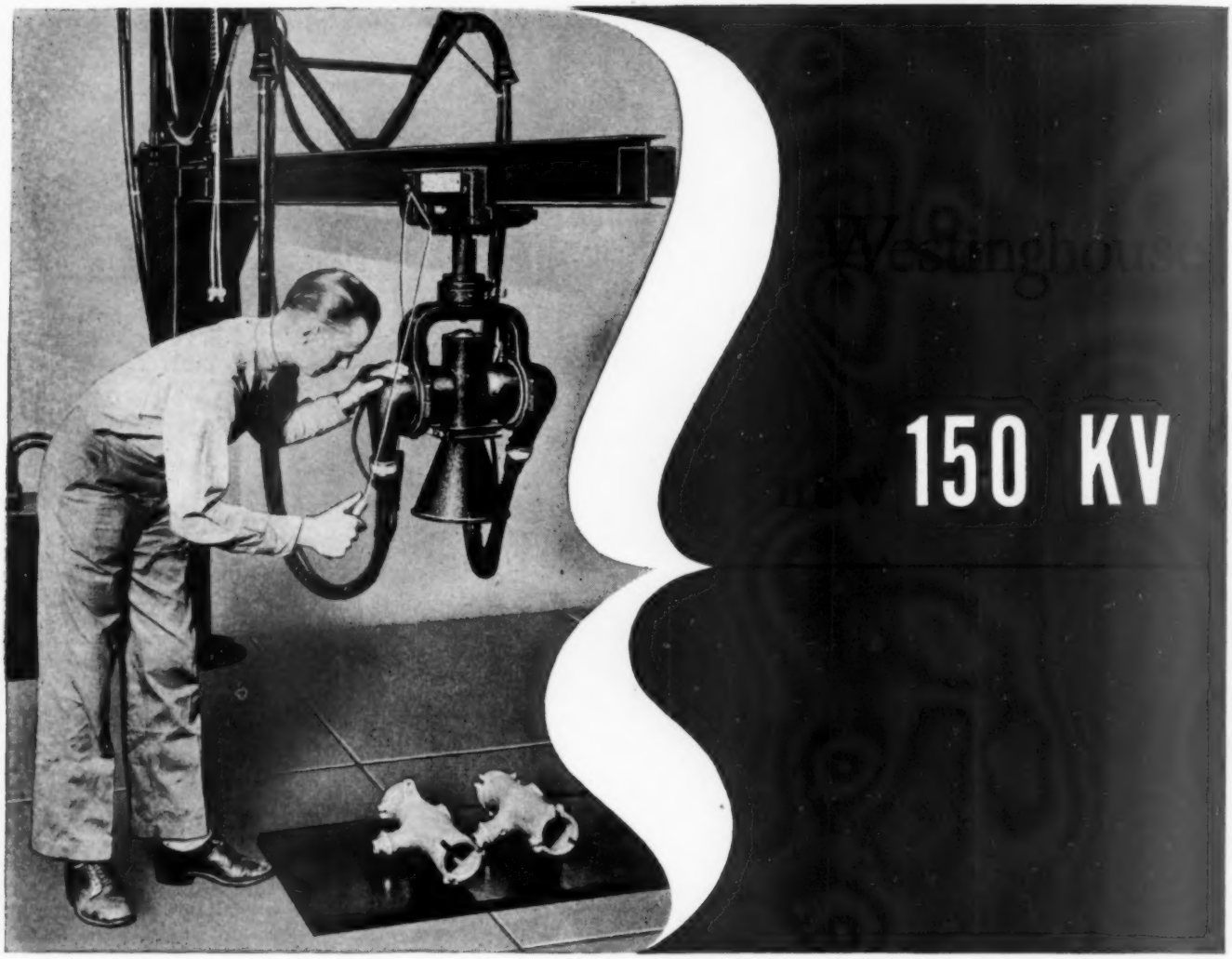

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(*Concluded from page* 186)

Explosions of Steam Boilers which reported its findings in 1837. In the study of materials failures a testing machine was constructed and described (Journal, Franklin Institute, February, 1832) and is still preserved in the Institute museum. In that period boiler explosions were prevalent and costly both in lives and property and extensive investigations were made both in this country and abroad to determine the causes of failure. While materials failures were frequent, most attention was paid to the need for indicating and control devices, and there was no evident attempt at materials specifications. The privilege of examining these reports was made possible through the courtesy of G. H. Clamer, The Ajax Metal Co.

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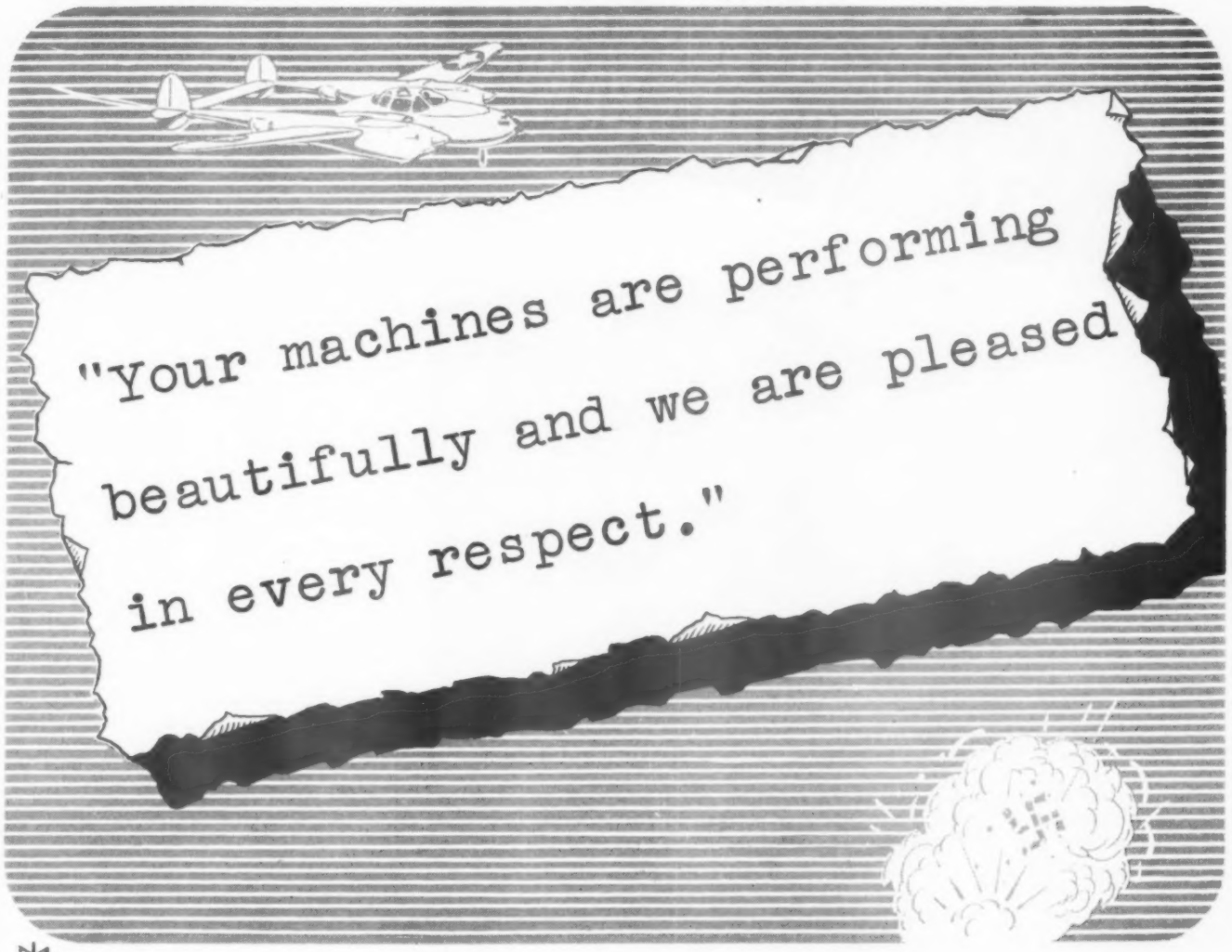
Ordnance Award Goes To Welding Group

The American Welding Society was presented the Ordnance Distinguished Service award during the recent National Metal Congress in Cleveland in recognition of its engineering advisory services for the development, manufacture and maintenance of ordnance material.



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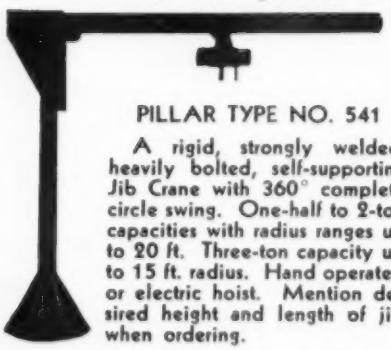
Women at work on wartime production have proved that today's hoisting equipment, such as the Chicago Tramrail installation shown in above photo, can easily and successfully be controlled by feminine hands. Even when loaded to utmost capacity, the same holds true.

Such perfection in the control of Chicago Tramrail hoists is complimented still further when loads are hoisted and transported not only the entire *length* but also the full *breadth* of the room. Or, from one room to another.

This is accomplished through the simple expedient of "transfer points" situated at strategic locations which switch the load from one monorail crane to another.



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PATTERNS FOR MAGNESIUM CASTINGS

(*Continued from page* 87)

sists of five cores, numbered as set in the mold. No. 1, for the first core into the mold, has rub allowance on its bottom surface. This core is held in place by four locators 90 degrees apart on the diameter of the drag core print. The main diameter of the core print is cleared allowing four locators to do all the positioning. This allows the core to seat in its exact position without being affected by core swell or variation.

No. 2 core or center hub is made in halves with a blind riser in the center. The two halves then are rubbed in the fixture on the center parting and drag end before pasting.

No. 3 and No. 4 cores have rub allowance on pasting surface and are pasted into one unit. This unit is positioned onto the No. 1 core by three locators between the spokes of the wheel with 1/32-inch clearance on the diameter to allow for core variation. This allows the Nos. 3 and 4 unit to be positioned after the flush pin gage is applied (See Fig. 2)

No. 5 core is used only to hold the upper end of the center hub core in place. This allows a riser to be taken off directly above the hub core without losing its location. Riser openings through the No. 5 core are not shown in this illustration.

Cores Positioned Accurately

Fig. 2 shows the last operation before closing the cope. Main body core Nos. 3 and 4 have been accurately positioned by four side flush pins, and top flush pins show the exact up-and-down position of the core.

The flasks are of heavy steel construction fitted with cannon pins and bushings which prevent the flask from shifting if rolled on a conveyor, or left standing near a jolt machine. The first sample casting from this equipment passed a micrometer inspection on all dimensions (on the plus side). The inside core was concentric with the outside diameter within 0.010-inch for 0.005-inch off center. However, the fact that a pattern is made very accurately does not mean that the casting will come out within tolerances unless precautions are used in handling the equipment in the foundry.

Most foundrymen look first at the pattern when dimensional trouble occurs in the foundry, and by following the path of least resistance, patch the pattern where the variation shows. This can be proved very easily if a complete set of plasters is kept on hand on production jobs. The sand cores can be set into a plaster mold and proved right or wrong. If the trouble is not in the core, then a sand mold should be made and plaster cores set into sand mold

(*Concluded on page* 196)

CORE BAKING · METAL MELTING
HEAT TREATING · BAKING COATINGS

One Complete Heat Processing Service that Produces Perfect Castings from Start to Finish

Gehnrich battery of large recirculating convection heated, car type core ovens.

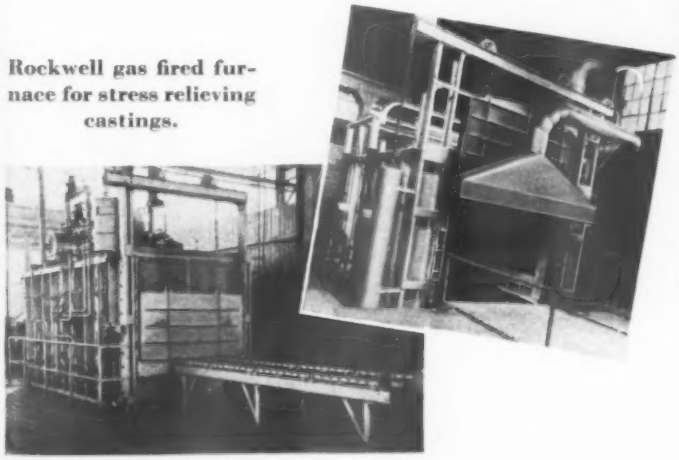
Gehnrich continuous 180 ft. travel, recirculating convection heated core pasting oven.

Let the multiple production benefits of a single source of heating equipment supply be yours. Whether it's a drawer type or cabinet drying oven, a conveyor oven for core baking, mold drying, low temperature annealing, or baking enamel finishes on castings, or any of the higher temperature melting, annealing, malleabilizing, stress relieving or heat treating furnaces, your selection of Rockwell-Gehnrich equipment throughout means better product quality, maximum output, better production efficiency and working conditions.

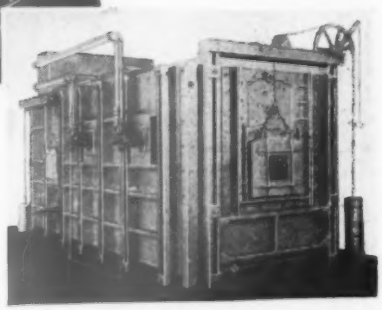
Over 56 years experience in pioneering, development and leadership in building ovens and furnaces for better foundry production are yours to exploit.

Rockwell standard tilting type, oil or gas fired, non - ferrous metal melting furnace.

Rockwell gas fired furnace for stress relieving castings.



Rockwell oil fired car hearth furnace for annealing castings.



Rockwell reverberatory type non-ferrous metal melting furnace.

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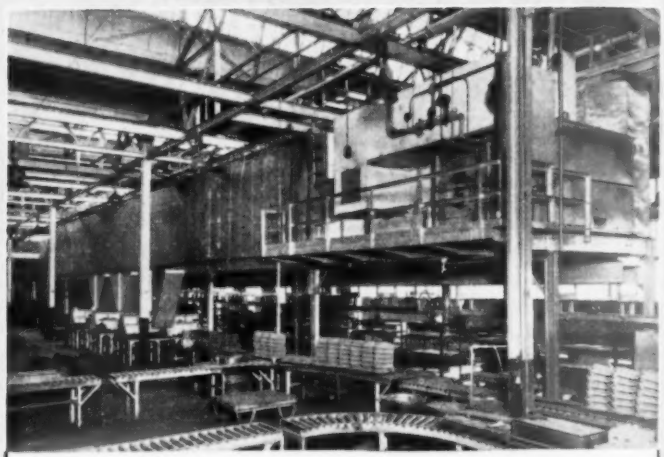
GEHNRICH OVENS · ROCKWELL FURNACES

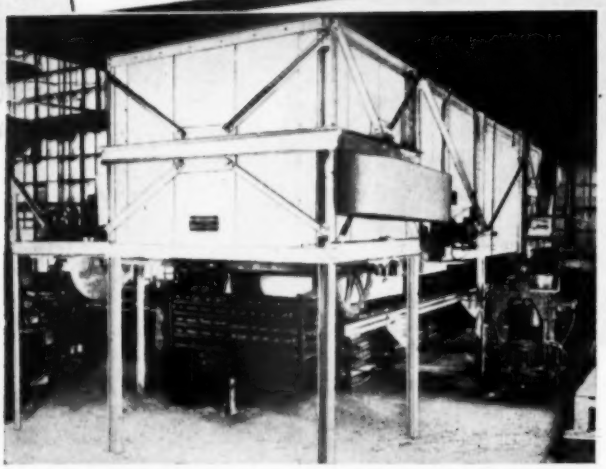
BATCH OR CONVEYOR TYPES • OIL - GAS - ELECTRIC - STEAM - COKE

Coleman Tower Oven for large production from small floor area. Patented Center Passageway permits loading from both inside and outside of Tower.

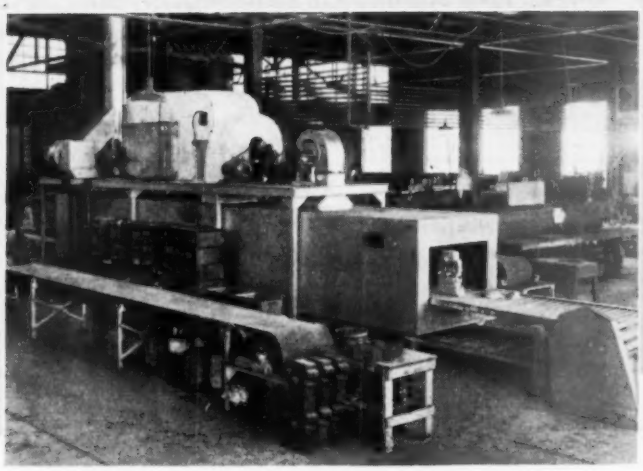
COLEMAN



Coleman Horizontal Core Oven, with overhead trolley type conveyor, for specialized or mass core production.



Coleman Horizontal Core Oven with double-chain conveyor, application generally limited to light or medium core work.



Coleman Horizontal Core Oven, with flat conveyor, for redrying cores after pasting, blacking or washing.

COLEMAN CORE AND MOLD OVENS

THE FOUNDR
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CLEVELAN

Conveyor Ovens FOR Every FOUNDRY REQUIREMENT

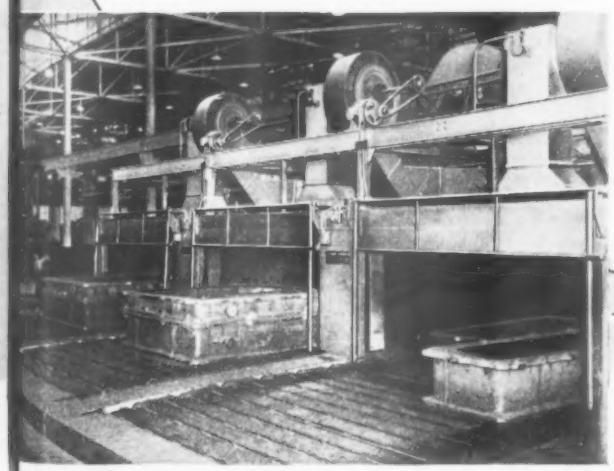
EVERY foundry has its own production problem. Equipment that is right for one foundry may be absolutely wrong for another. Therefore, a successful mechanized core oven installation requires a proper analysis by thoroughly competent and experienced engineers.

Coleman Oven Engineers offer the most extensive background of successful experience in the foundry oven field.

Coleman Conveyor Ovens are built in many different types, each designed to best meet specific operating requirements. These include such designs as Tower Ovens, Horizontal Over-Head Conveyor Ovens, Double-Chain Single or Multi-Pass Conveyor Ovens, Flight Conveyor Ovens, Combination Vertical and Horizontal Conveyor Ovens, etc.

Why not profit by our extensive experience which includes 40 years of specialization in designing and building foundry ovens? An investigation of a Coleman Conveyor Core Oven to best meet your needs may disclose an opportunity to obtain savings in production costs.

Coleman Oven Engineers will gladly survey your requirements and offer recommendations without obligation.



Coleman Conveyor Mold Ovens for high speed continuous drying.

The most complete line of Foundry Ovens built

also includes the following types

COLEMAN Portable Ovens
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COLEMAN Car Type Ovens
COLEMAN Portable Mold Driers

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EM. D SWARTWOUT OVENS
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COLEMAN CORE AND MOLD OVENS

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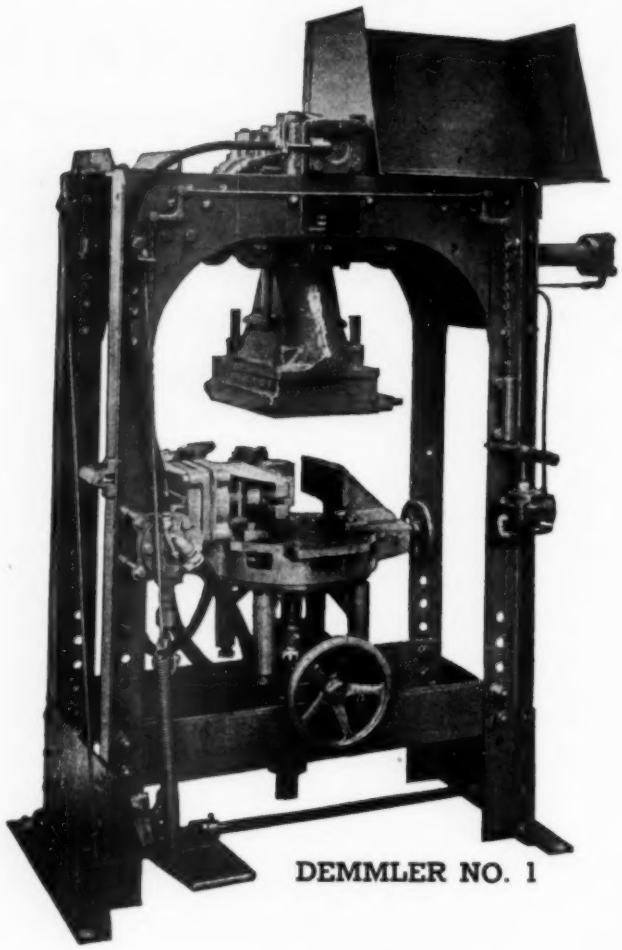
DEPENDABLE CORE BLOWING EQUIPMENT



DEMMLER NO. 1

This unit designed especially for small core work such as plumbing goods, electrical fittings, stove burners, valves and small pipe fittings. Ideally suited to quantity core production on all types of small brass, malleable, and gray iron work. Detailed specifications on this or other models on request . . . a type and size for every core blowing need.

WM. DEMMLER & BROS.
KEWANEE, ILLINOIS

CORE BLOWERS Exclusively

(*Concluded from page* 192)

which should show the same line-up as in the plaster mold.

There is only one fundamental rule for solving dimensional trouble in the foundry. Never make a pattern dimensionally wrong in order to get a casting to come out right unless all other means have been exhausted. At least ten sample castings should be made and the possible causes checked very thoroughly before a deviation from the blueprint is made on the pattern. The causes that are hard to find usually are the ones causing the trouble. Following are some of the more common ones in the coreroom:

1. Crooked core plates (very common).
2. Dull and crooked rubbing bars.
3. Warped dryers or improperly spotted dryers.
4. Excessive rapping.
5. Hand drawing of cores.
6. Improper wiring of cores.
7. Assembling cores without rubbing when stock has been allowed.
8. Springing boxes out of shape by improper clamping on draw machine.
9. Using too light core plate for heavy cores.
10. Jarring when trucking to oven.

The most common in the foundry proper are:

1. Trying to make too large a casting without bars in flask.
2. Carelessness in the use of gages.
3. Poor bottom boards.
4. Jarring on conveyors.
5. Filing of cores.
6. Worn-out draw machines.
7. Worn-out flask pins.
8. Allowing patterns to get out of repair.
9. Improper mounting of pattern on jolt machines.

Another cause of dimensional trouble is improper design of pattern equipment. This can be prevented by close cooperation between the patternmaker and the foundry. All of these factors should be especially watched in the magnesium foundry, due to the rigid dimensional inspection which is required in the aircraft industry. The automotive industry has been coping with the same problems for years, but in a set-up where the same casting is run day in and day out very elaborate steps can be taken in designing gages, fixtures, jigs, etc. which will make a job almost fool-proof. In the foundry where limited production does not permit costly arrangements of this kind it is necessary to establish close control through proper supervision and follow-up methods.

Safety Rules for Truck Operators

In response to demand for additional copies of safety rules for operators of power industrial trucks, issued by Elwell-Parker Electric Co., Cleveland 14, earlier this year, a pocket-size folder presenting the 34 safety ideas for operation of all types and makes of power trucks, is available upon request.

Est. CITY PATTERN FOUNDRY & MACHINE CO. DETROIT, MICH. 1913

ASTING about for a suitable holiday message is difficult while we all are working at top pitch, full of enthusiasm to do our part in winning a war.

May the day come soon when the pattern for peace is molded in such a manner that peoples of all nations can say, Merry Christmas and peace on earth to men of good will.

CITY PATTERN
FOUNDRY AND MACHINE CO.

1161 Harper Ave. at Rivard St. • Detroit 11, Mich.

CASTINGS AT THE METAL SHOW

(*Continued from page* 92)

good cupola practice is a matter of simple arithmetic and rigid adherence in practice to an established procedure. Careful attention should be given to bed height, coke size, size of material charged into the cupola, intermediate coke and iron charges, etc. Cupola blower should be somewhat oversize, and various devices such as pressure gages, volume gages, air-weighing equipment, etc., assist in repeating the same performance day in and day out.

R. G. McElwee discussed inoculants to improve uniformity and stated that those could be divided into two types. The one is the graphitizing type containing predominant quantities of silicon and carbon, and the other is the stabilizing type containing chromium. In general the graphitizing type inoculant is used in low carbon-equivalent irons which normally would range from a pure white structure to a structure containing only a slight excess of cementite if inoculation or graphitization was not utilized. The stabilizing type normally is introduced in the higher carbon-equivalent irons or those that would be pearlitic or contain some ferrite in the heavy sections if inoculation was not used.

Inoculation has the effect of converting eutectiform or type D graphite structure to the normal structure containing randomly distributed graphite flakes. Type D structures occur most frequently in zones of rapid cooling; normally in the zones of a casting immediately adjacent to the chill surfaces, and consequently those undesirable structures are most prevalent at the machining or wearing surfaces of the casting where they can be most detrimental. Inoculation in general increases all the mechanical properties, uniformity or reproducibility of structure, and wear resistance. It decreases the tendency toward chilling, hard spots, poor machining, and porosity due to nonuniform structure.

Amount of inoculant to be used depends upon type and application. Graphitizing type is used in the range from 0.10 to 0.20 per cent except where drastic chill reduction is required, and then up to 0.50 per cent may be employed. Stabilizing type inoculant is used in the range from 0.50 to 3.0 per cent depending upon the brinell hardness and tensile strength required. For maximum economy melting technique should be controlled carefully. Ladle inoculants are not cure-alls, but when judiciously used they provide a useful tool for production of quality gray iron castings.

Flame Harden Gray Iron

John Erler discussed flame hardening of gray iron. He stated that the irons to be used for that purpose should have tensile strengths ranging from 40,000 to 60,000 pounds per square inch. Any alloy or combination of alloys which will lower the critical temperature not only will permit lower quenching temperature, but also decrease warpage. A general specification suitable for flame quenching may contain 3.3 per cent total carbon maximum, 1 to 2 per cent silicon, 0.6 to 1 per cent manganese, 1 to 2 per cent nickel, and 0.75 per cent maximum chromium plus molybdenum plus vanadium.

In some cases it may be necessary to stress relieve castings previous to flame hardening by treatment at 1200 degrees Fahr. In some applications where the flame hardened case results in an area of tensile stresses, a stress relief is recommended due to the change from compression to tensile stress in a rather narrow vicinity. A draw of 300 degrees Fahr. will reduce hardening stresses between 25 and 40 per cent.

Mr. Erler pointed out that it was necessary to exercise considerable care in flame hardening since thin sections heated up more rapidly and might result in cracking. Also since surface temperatures in the process cannot be measured, the surface can be melted. Selective hardening permits drastic quenching methods, and at times considerable aus-

(*Continued on page* 200)

DAYTON SNAGGING WHEELS

For fast snagging with minimum wheel wear or operator fatigue specify Daytons. Preferred by hundreds of steel and gray iron foundries from coast to coast for years.

SIZE, SHAPE, GRAIN AND GRADE REQUIRED. WRITE, PHONE OR WIRE.

SIMONDS WORDEN WHITE CO.

710 NEGLEY PLACE, DAYTON 7, OHIO

PRECISION AT 2,000,000 VOLTS

ANOTHER MACHLETT TECHNIQUE

WE ARE not going to tell you here why this tube was made, what it does, or what it is for. The important thing about it to you as a user of industrial X-ray tubes, and of oscillators for induction heating, is that it represents the toughest assignment ever handed the electronic tube industry, and that of all tube makers only Machlett perfected the techniques that made the tube possible.

The tube is sealed-off, vacuum-tight, and operates at 2,000,000 volts, direct current. These and other difficult conditions were essential to assure high and constant power, reduction of heat, and precise focusing of the electron beam.

Electrical and mechanical problems presented by the tube were so severe that some scientists doubted they could be solved, but Machlett, drawing upon its long experience, met every requirement in a little over two years.

This is significant to you because every electronic tube, whether it produces X-rays, or radio waves, or is a rectifier, depends for its success in your service upon correct design, proper vacuum, adequate insulation, and precision-made parts, to assure precise control of the electrons that make any such tube function.

The perfection of this 2,000,000-volt direct-current tube is the best proof we can offer of the value of the Machlett skills that go into the design and manufacture of every tube bearing our name . . . Machlett Laboratories, Inc., Springdale, Connecticut.

MACHLETT

X-RAY TUBES SINCE 1898

TODAY THEIR LARGEST MAKER

(*Continued from page* 198)

tenite can be found in the outer layer. In extreme cases that austenite might exceed the martensite, and the material be condemned for poor hardening characteristics.

Strong castings were discussed by William A. Hambley, who pointed out that use of alloys was not necessary in all cases since by proper attention to raw materials, composition, melting and molding practices it is possible to make castings suitable for numerous applications. However, where desired, certain physical properties can be enhanced by use of alloys added to a base iron of suitable composition. Only in that way was it possible to attain the most beneficial effect of the alloy additions, and to conserve them to the fullest extent.

Mr. Hambley said that the general consensus in regard to alloys was that better results were obtained through additions of small amounts of several alloys than addition of an equal or larger amount of a single alloy since it has been found that the various alloys tend to increase the effectiveness of each other. He also mentioned that with some high strength castings it was necessary to subject them to heat treatment to attain the highest tensile strength. He cited a case where the tensile strength as-cast showed around 40,000 pounds per square inch, but following a stress relief heat treatment at 950 degrees Fahr., which after an interval was increased to 1150 degrees Fahr., the tensile strength was increased to 77,000 pounds per square inch.

In his summary James T. MacKenzie pointed out that gray iron was a series of alloys rather than a single composition, and hence it was possible to meet a variety of service applications. By attention to composition, melting and molding practices, quality gray irons could be produced to meet engineering requirements. He said the various speakers had indicated the progress made in gray irons over a period of time, and the foundrymen should use those facts to educate their customers on the value of improved gray irons.

Institute of Metals Division, American Institute of Mining and Metallurgical Engineers held two sessions on magnesium. At one meeting N. Tiner, Permanente Metals Corp., Permanente, Calif., presented a paper on "Liquid Solubility of Manganese in Magnesium" which concluded that the liquid solubility of manganese in magnesium is limited and depends upon the temperature and the amount of other alloying elements present, that the diagram of Ruhrmann is erroneous, that either the solid solubility of manganese in magnesium at the freezing point is less than 2.3 per cent and the x-ray measurements of Schmidt and Siebel are incorrect, or the alloys show a peritectic reaction. The latter point has not been investigated, but assuming such a reaction, it is possible to construct a constitution diagram that will conform to the phase rule.

Presents Results of Tests

O. J. Myers, Wright Aeronautical Corp., Lockland, O., discussed "Oxidation Inhibitors in Core-sand Mixtures for Magnesium Castings" and presented the results of an extended investigation of the use of various amounts of such materials as sulphur, boric acid, diethylene glycol, and ammonium-fluoride salts; singly and in combination. Mr. Myers found that additions of sulphur alone up to 1.5 per cent gave poor results, but that with 2.5 per cent they were fair with no improvement at 5 per cent sulphur. With additions of boric acid alone up to 1.5 per cent results were good, but at 2.5 per cent results were fair and at 5 per cent boric acid they were poor. Good results were obtained with additions of ammonium silicofluoride up to 1 per cent while fair results were obtained with 0.5 per cent diethylene glycol.

Study of combinations of sulphur and boric acid showed that with 0.25 per cent of each the results were fair while with 0.5 per cent each good results were obtained. However, when the percentages of each were increased to 0.75 and 1.25 per cent, results obtained only were fair. Experimental runs on production with 0.5 per cent each of boric acid and sulphur gave excellent results. Exces-

(*Concluded on page* 202)

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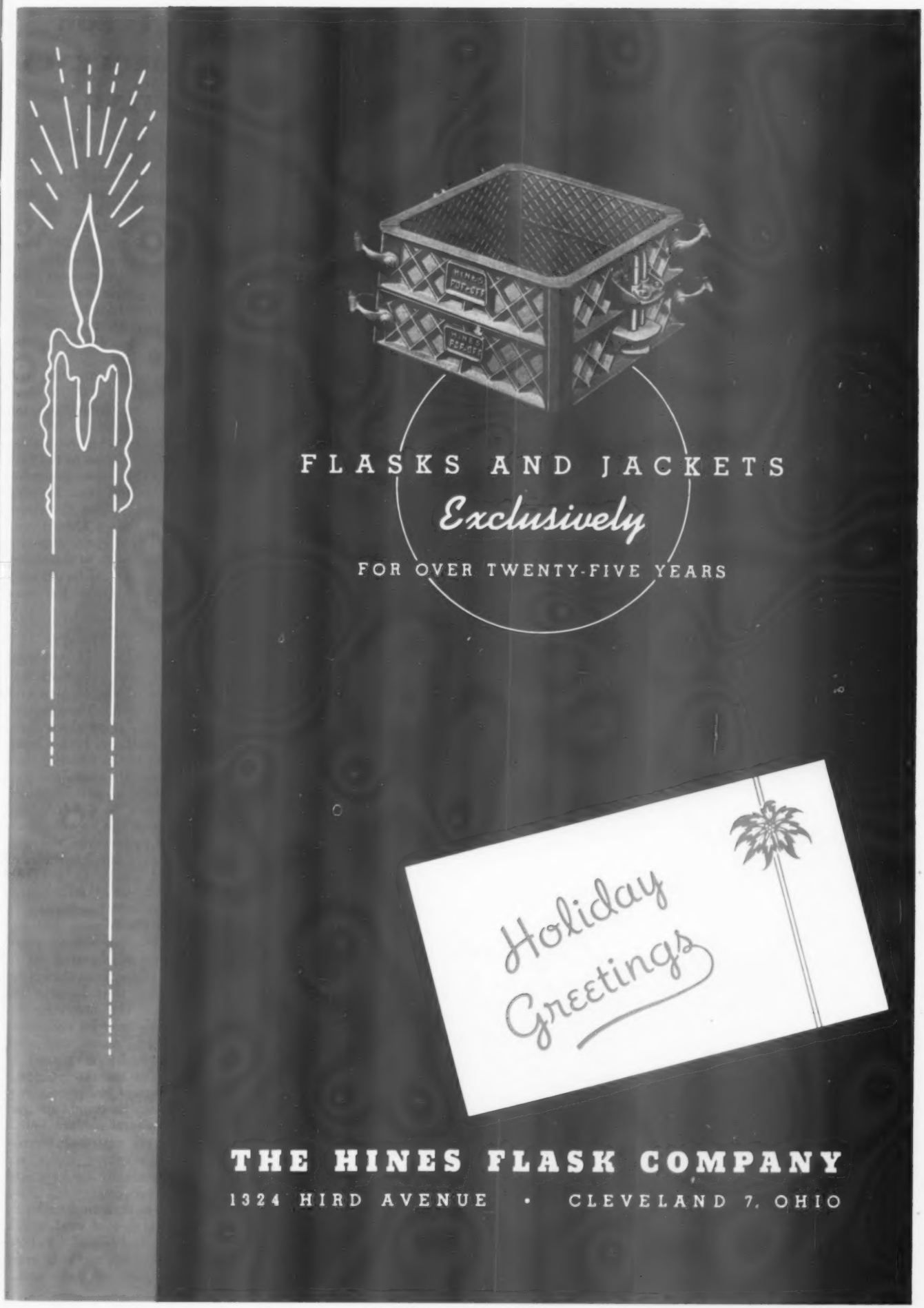
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Exclusively
FOR OVER TWENTY-FIVE YEARS
Holiday Greetings
THE HINES FLASK COMPANY
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(*Concluded from page* 200)

sive amounts of inhibitors cause gassing and are detrimental. Boric acid is a much stronger inhibitor than sulphur, but when used alone it destroys the desired knockout properties. If sulphur is used alone surface properties of the casting are inferior. Hence, a combination of boric acid and sulphur is desirable.

At another session of the Institute of Metals Division R. S. Busk and C. W. Phillips, Dow Chemical Co., Midland, Mich., presented information on "Grain Size Properties of Sand-cast Magnesium Alloys", and concluded that since it is possible to superheat those, the grain size of commercial castings can be kept well under control. Average grain size is about 0.006-inch, and it is rare to find any larger than 0.030-inch. Comparing that range of grain size with data on properties, the magnitude of the property effect is small. While the grain size does have a positive effect on mechanical properties and should be controlled carefully, such control is available, and emphasis should be placed on other variables such as porosity, which affect mechanical properties adversely.

Semi-Steel Test Foundry Co., 901 North Kilpatrick avenue, Chicago, is completing a plant expansion which will triple its capacity for gray iron castings.

SMOOTH, CLEAN
CHILL NAILS
ASSURE
SOUND
CASTINGS
CAPEWELL
HACK SAW BLADES
Cut Costs and
Cut Time . . .
Improved heat treating is responsible for the faster cutting and longer life of Capewell hack saw blades. Hence the saving in production time and costs. Prove these advantages with your own tests.
Capewell foundry chill nails are smooth, clean and bright — because they are cold rolled from the finest soft iron. They fuse readily. The Capewell line — the most complete — has the right nail for your job. Send for samples.
THE CAPEWELL MFG. CO.
Hartford, 2, Conn.
MOLYBDENUM
TECHNITE
HIGH SPEED
CAPEWELL
CHILL NAILS • HACK SAW BLADES

LAYOUT FOR HIGH FREQUENCY MELTING

(*Continued from page* 86)

cubiclized units are available up to 250 kilowatts. All that is needed to install them are foundations, power line and water connections. They have the advantage of being semiportable.

With larger furnaces up to 1200 kilowatt capacity, the motor-generator set and the water-cooled capacitors are housed best in a separate room off to one side or behind the furnace location. Bus bars running through trenches carry the high frequency current to the furnaces.

Although it is best to place the motor-generator room as close to the furnaces as possible, some have been installed satisfactorily as much as 400 feet away. However, it is always advisable, to have the capacitors as close to the furnaces as possible. The motor-generator room should be protected from foundry and air-borne dust by sealing the doors and windows and by using a filtered ventilating system with sufficient capacity to create a positive pressure in the motor room. Enough space should be allowed in the motor-generator room for easy servicing and cleaning.

Keep Furnace Platform Clean

Height of the furnace, when tilting type furnaces are used, depends entirely upon the size of the furnace and the pouring methods used. The furnaces may be placed below, at or above floor level on a raised platform. The spout of the furnace when in the pouring position must be conveniently above the particular mold or ladle required. Since the melting operation is dirt-free, the furnace platform easily can be kept clean at all times. To protect the operator from possible shock and small particles of spilled or splashed metal, an auxiliary wood platform with spaced floor boards should be placed around the furnace.

Slag raked from the furnace and any spill-over that may occur during pouring can be confined to a grated pit or sand area on the floor immediately in front of the furnace, thus keeping the foundry floor tidy. The metal in this material subsequently may be reclaimed.

The furnace control panel, and work desk if desired, usually is placed in back of the furnace on the platform. All controls and meters are within easy reach of the operator. So simple are they to operate that in several modern foundries the furnaces are operated entirely by women. The weighing scales and alloy additions also usually are kept conveniently near the furnaces.

In a well-planned modern foundry, a continuously cyclical flow of sand, molds, flasks and metal is maintained. Following is a discussion of the methods available for handling each of these simul-

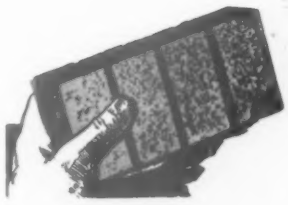
(*Continued on page* 204)

AN active slag hole—noticeable where Famous Cornell Cupola Flux is used—gives evidence of healthy cupola conditions. It assures that the impurities present in all cupola charges, are being largely eliminated instead of passing into the ladle to produce porous, inferior castings.

In a report to the head office, a well known foundryman recently wrote, in part: "We have eliminated slag hole freezing, excessive bridging and other troubles by lowering the limestone and using Famous Cornell Cupola Flux.

Chipping time is cut in half, reducing patching costs for both refractories and labor. Better results are obtained in the hot section of the cupola and longer life above the melting zone due to glazing caused by the flux.

You know the manifold improvements that attend these results, but are you familiar with the many other benefits of Famous Cornell Cupola Flux?



FAMOUS CORNELL FLUX

for
Brass and Aluminum Castings

there are Special Famous Cornell Fluxes, each having Definite and Exclusive Features and Advantages

The CLEVELAND FLUX *Co.*

Manufacturers of Iron, Brass and Aluminum Flux Since 1918

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CLEVELAND, OHIO

(*Continued from page 202*)

taneous cycles, based upon a study of three modern, efficient foundries. These include the Gorham Tool Co., Detroit, which was described in considerable detail in the August, 1943 issue; the American Hammered Piston Ring Division, Koppers Co., Baltimore, which was described in the July, 1944 issue, and the Indiana Steel Products Co., Valparaiso, Ind.

In each of the foundries, floor plans of which are shown in Figs. 4, 5 and 6, up-to-date sand mixing and reconditioning equipment is used. In the American Hammered Piston Ring Division and the Indiana Steel Products Co., the reconditioned sand is carried by overhead distributing belt conveyors to hoppers above the molding machines. At Gorham Tool Co. (Fig. 6), where fewer but larger individual castings are made, the sand is carried to the molders by rail car.

At the Indiana Steel Products Co. (Fig. 5), the shakeout is done near the pouring station, the sand falling through a grate onto a belt conveyor which returns it to the storage bin. At American Hammered Piston Ring Division and Gorham Tool Co. (Figs. 5 and 6), molds are carried by roller conveyor or track car to shakeout screens, under which are conveyor belts which return the sand to the storage bin. In all three of these foundries, manual sand handling has been reduced to a minimum or eliminated entirely.

Conveyor systems or rail cars also greatly reduce mold handling. At the Indiana Steel Products and Gorham Tool Co., a pair of roller conveyors or tracks extends from the mold station to the pouring station and on to the shakeout station. At American Hammered Piston Ring the molds, piled in multiple on a cast iron dolly, are conveyed on one of the tracks from the molding machine to the pouring station and then on to the shakeout station. The empty dollies then are lifted to the return track, and the empty flasks are piled on them for return to the molder. The same dollies are used off the tracks for handling return scrap, other furnace charges and tote boxes. The track at Gorham Tool Co. is continuous so that all work stations are reached in rotation with no backtracking.

In other plants, such as shown in Fig. 3, the molds are placed on roller conveyors which pass right under the furnaces, permitting pouring directly from the nose tilting type furnaces into the molds. Similar schemes can be worked with rail car or dolly systems. However, care must be taken at pouring stations to prevent clogging of the rollers by spilled metal.

Units In Close Group

It is in the metal flow cycle, including charging, melting, pouring and handling of return scrap that the induction furnace permits the greatest advances in foundry layout. The charge, consisting of returned scrap, ingots and virgin material, can be brought from the weighing station to the furnace by any convenient means, such as hand truck, rail cars, conveyor, or monorail. In most well planned modern foundries, the shakeout, scrap return and storage, and weighing stations are all located close to the furnace to minimize material handling.

Charging can be done easily by hand or shovel in the average sized furnaces. In larger units, the furnaces can be charged by special charging cars, scoops, or cranes. Where it is desired to charge the furnace with loose bulky scrap, special charging stacks or crucible extenders can be used.

The melting cycle of the high frequency furnace is very short. (600 pounds of Alnico in 40 minutes at 300 kilowatts; 225 pounds of high tin bronze in 25 minutes at 100 kilowatts, as examples). No mechanical stirring is required as the currents induced in the charge produce a stirring action that gives positive mixing. This is particularly important not only in producing uniform, exact analyses, but also in melting some alloys such as Alnico, where there is a tendency for the aluminum to float on top.

Because of the close control afforded by high frequency melting, a desired pouring temperature can be attained quickly and maintained accurately.

(*Concluded on page 206*)

Speaking of Shakeouts...

WHAT ABOUT ADAPTABILITY?

When you first buy a Shakeout, you may have just one specific purpose in mind—one type of job you want it to perform. But, once it is installed, you think of several other things you could do with it IF . . .

. . . if it is adaptable; if it is efficient; if it is strong enough to stand up under the other (usually heavier and more difficult) service. That's where the Robins Floatex comes through . . . every time!

Take the eastern foundry illustrated. That's only a portable model you see. Yet it is able to handle those 10 copes with ease—shaking them utterly free of sand in exactly 36 seconds!

What's more—we built a hopper and moistener right in the unit. So the sand is delivered by the Floatex directly into a conditioner. Thus, the sand passes from the flasks to the heap, tempered and ready for re-use, all in one continuous operation. Think of the TIME that saves! Think of the LABOR that saves! Think of the MONEY that saves!

If you would like more facts about this Floatex installation—or about the Floatex itself, which is made in models to handle 100 lbs. to 100 tons and more—they are yours for the asking. Just drop a line to Dept. F12.

ROBINS *makes:* BELT CONVEYORS • COAL AND ORE BRIDGES • BUCKET ELEVATORS • CAR AND BARGE HAULS • CAR DUMPERS • CAR RETARDERS • CASTINGS • CHUTES • CONVEYOR IDLERS AND PULLEYS • CRUSHERS • FEEDERS • FOUNDRY SHAKEOUTS • GATES • GEARS • GRAB BUCKETS • PIVOTED BUCKET CONVEYORS • VIBRATING SCREENS • SCREEN CLOTH • SELF-UNLOADING BOAT MECHANISMS • SKIP HOISTS • STORAGE AND RECLAIMING MACHINES AND SYSTEMS • TAKEUPS • LOADING AND UNLOADING TOWERS • TRIPPERS • WEIGH LARRIES • WINCHES • WINDLASSES

FOR MATERIAL AID IN MATERIALS HANDLING . . . . . *It's* **ROBINS**

ENGINEERS • MANUFACTURERS • ERECTORS

ROBINS CONVEYORS
INCORPORATED
Founded in 1896 as Robins Conveying Belt Co.
PASSAIC • NEW JERSEY

MATERIALS HANDLING MACHINERY

It's "KNOW HOW" that Produces Results

for NORTON RESINOID WHEELS

1. **Research "Know-How"**— It took Norton laboratory men thousands of man-hours to perfect the various Resinoid bond formulas in use now—each right for a certain type of grinding.
2. **Manufacturing "Know-How"**— Men who have been making grinding wheels for from a quarter to a half century put their knowledge to use with the best equipment obtainable.
3. **Engineering "Know-How"**— But it's the Norton abrasive engineers who get into the shops and make the final selection—a selection that may make the difference between success and failure of a grinding wheel.

It's this combined "Know-How" that gives Norton Wheels for portable grinders their outstanding performance.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

NORTON ABRASIVES

W-980A

(*Concluded from page 204*)

Where the furnaces are melting metals that are extremely susceptible to contamination and oxidation, the molten metal can be protected by one or more of the usual slag coverings. In many foundries, a cover is placed over the crucible during the last few minutes of the melting cycle.

Pouring of the high frequency furnace can be done in any one of a number of ways. Small laboratory furnaces can be picked up and poured manually. In some of the larger plants, 4-ton nose tilting furnaces are picked up bodily by crane and whisked over to the casting machines where the furnace is used as a ladle to pour the charge directly into the molds.

However, most common pouring practices, are either crucible or ladle pouring, or pouring directly into the molds from the furnace. In the former methods, nose tilting type furnaces are poured into crucibles or ladles which are then carried by monorail or shanks to the molds. The furnace is tilted by an overhead electric hoist, or by pneumatic, hydraulic, or manually operated hoists. By using a monorail hoist that runs along the back of the furnaces, one overhead hoist can service a line of several furnaces.

The lift coil type of high frequency furnace is used in nonferrous metal foundries where crucible melting and pouring practices are established firmly. In a typical modern bronze foundry, two crucibles are based on a small rail car, as shown in Fig. 1, so that the lift coil can be lowered around one pot for melting while the other pot is being poured and recharged. The coil is lifted by hand hoist or motor operated hoist, and the pot is picked up in a monorail-supported shank and carried to the molds.

Most efficient method for pouring, and one particularly preferable for larger molds, is to pour directly from the nose tilting type furnace into the molds.

Removal of gates, risers, etc., for return scrap can be done efficiently before or after sand blasting and cleaning. In the best planned foundries, the return scrap removal station and sand blasting equipment are positioned close to the shakeout for smoother flow of materials.

The return scrap is segregated carefully by heats. With critical composition metals, samples are taken of each heat and analyzed. Report of this analysis is on hand at the weighing station a short time later when the scrap is withdrawn from the storage bins for new heats. Scrap and ingot storage bins should be positioned close to the weighing station.

Return Is Prompt

Inspection tables, by being located right near the sandblasting or tumbling equipment, in the compact layout, can be instrumental in promptly returning defective castings to the remelting cycle. With critical analyses, all castings from the different heats should be segregated at least until the composition has been checked in the laboratory. Similarly, all rejects should be segregated.

The speed of sampling, analysis, inspection, and return of gates, risers and rejects to the melting cycle is important for accurate composition control and smooth flow of material through the foundry—particularly where castings are small and the return scrap is proportionately high. As an example of rapid flow of material, sand blasted bronze piston ring castings are on the inspection table at American Hammered Piston Ring Division, never more than three hours after the start of the mold making. To top off the close control over all foundry operations, any regularly occurring defect is immediately brought to the attention of the molding machine operator who did the job with instructions on how to correct it.

Furnace installations discussed in this article refer to the Ajax-Northrup type.

Correction

The article, "Bench Coremaking Time Standards for Job Shops" presented on Page 80 of the November issue was prepared by Edward A. Grede, who is now connected with Grede Foundries Inc., Milwaukee. THE FOUNDRY regrets exceedingly that an error was made in connection with the signature on that article.

AT THE FIRST "LULL" IN PRODUCTION *Commission* LANLY *to* REBUILD *and* RECONVERT WORN or OUTMODED EQUIPMENT

Order cutbacks will bring "respites" to many overworked core and mold ovens and give manufacturers opportunities to replace—repair equipment—modernize it—or modify it to meet new demands.

Time can well be spent in advance to determine who is most competent to handle such problems with which you are likely to be confronted.

The designing of all types of foundry ovens and the rebuilding and remodeling of various kinds and makes of equipment, qualifies the Lanly Company for the competent handling of this kind of work.

Lanly heaters have a wide range of capacity and are very flexible as to position of installation.

The insulated sectional panel construction of Lanly ovens makes them relatively easy to move, enlarge or rearrange to fit new requirements.

The Lanly Catalog illustrates the wide scope of experience. Send for a copy.

If you have an unusual or entirely new problem we'll be glad to discuss it with you. No obligation will be entailed.

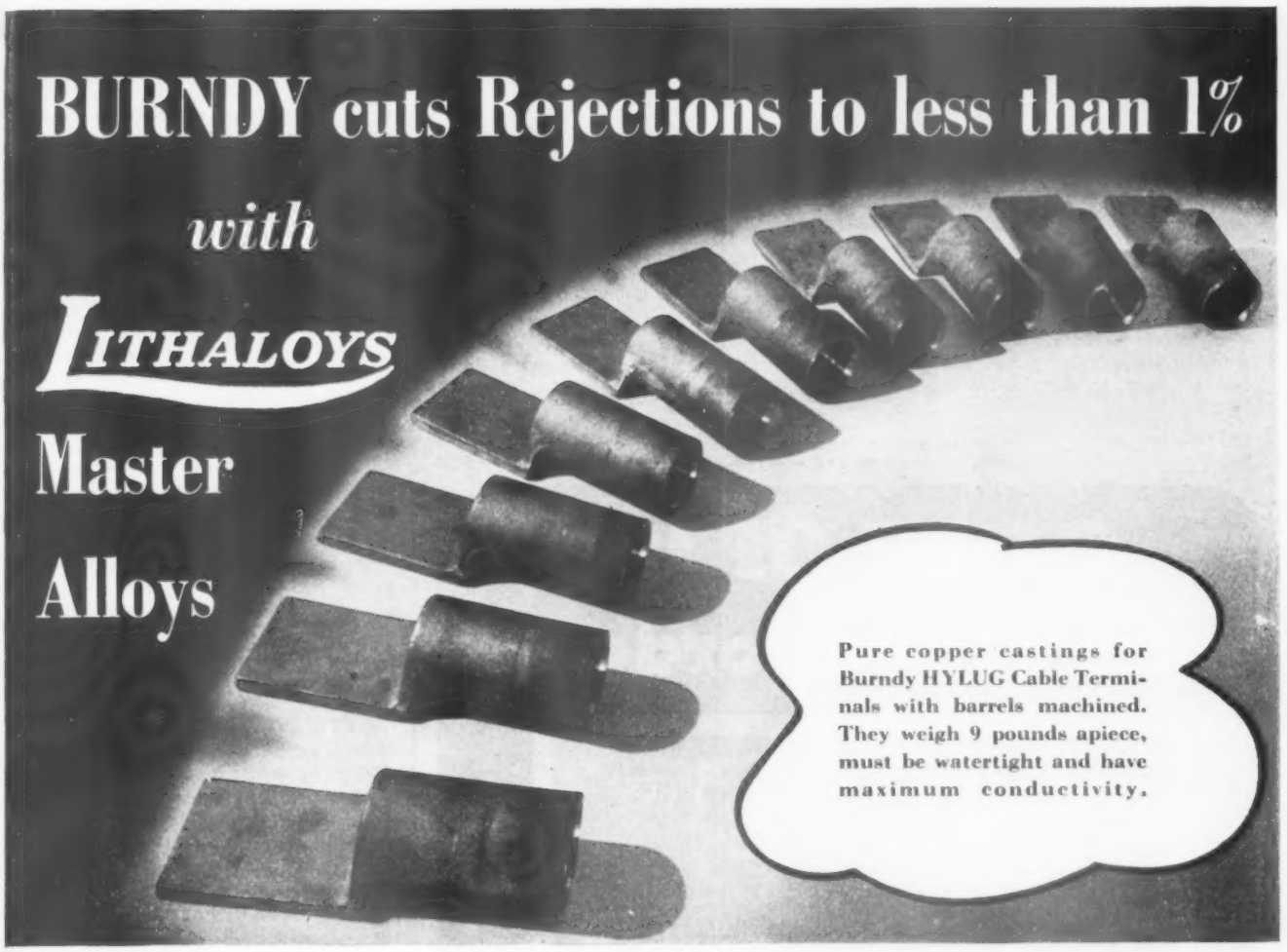
THE LANLY CO.
OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
750 PROSPECT AVENUE · CLEVELAND, OHIO

BURNDY cuts Rejections to less than 1%

with

LITHALOYS

Master Alloys



Pure copper castings for Burndy HYLUG Cable Terminals with barrels machined. They weigh 9 pounds apiece, must be watertight and have maximum conductivity.

Terminal lugs must stand up under severe operating conditions which means that the castings *must* be right to start with. Several years ago, Burndy engineers adopted Lithium treatment as a positive means of maintaining their well-known high standards.

Before Burndy used Lithium Master Alloy, their rejections, after machining, ran over 25%—mainly due to porosity. Today, not only have rejections been reduced to an average of *less than 1%*, but Burndy standards, at the same time, have actually been increased with respect to strength, density and conductivity.

This is not an isolated case. Many others, even though their materials need not meet such exacting inspection, have found Lithium treatment profitable. Melts of copper, tin bronze and silicon bronze, treated with Lithium, yield castings more uniformly free from porosity and gas cavities...with non-metallic impurities effectively removed...and with optimum physical properties...at a small fraction of the cost of *one* reject.

And this treatment calls for no special equipment, no special training, no departure from conventional foundry practice. Shortly before pouring, Lithium metal is simply stirred into the melt in the form of a stable master alloy containing a small percentage of Lithium combined with other metals to match the melt.

To assist you in investigating this money saving treatment, we offer the use of our own casting facilities and the services of our technical staff —without obligation. 11-LC-3

LITHALOYS CORPORATION

444 MADISON AVENUE, NEW YORK 22, N. Y.

WASHINGTON Notes

FOUNDRY labor shortage frequently has been mentioned as an important factor in restricting some of the more urgent phases of the war production program. In the case of automotive engines, however the labor stringency is not confined alone to foundries. It was brought out at a meeting of WPB with its Industrial Liquid-Cooled Engine Industry Advisory Committee that manpower rather than facilities is the retarding factor in full production of automotive engines, and that labor shortages exist from the foundry level on up to finished products. Castings production has shown some improvement, but engine builders also still face a labor problem.

★ ★ ★

Recent WPB discussions with the Gray Iron Foundry Industry Advisory Committee indicate that overall manpower conditions are improving only slightly. Other points brought out in such meetings are: In most instances, the War Labor Board is handling foundry cases satisfactorily; scrap losses and rejections are higher than in prewar periods; foundries are not overburdened with WPB reports; visits to foundries by representatives of armed forces and government agencies are excessive and consume too much time of foundry executives and top operating men; clear identification of urgent military orders needed on "hot" programs would aid foundries in expediting casting production.

★ ★ ★

WHEN the OPA on Oct. 12 amended its price regulation applying to nonferrous castings to permit use of maximum prices of metals, rather than current metal prices, in figuring quotations for new castings, some question arose as to whether prices established before Oct. 12 could be recalculated on the new basis. The answer is no, the revised regulation applying only to castings that do not already have an established maximum price.

★ ★ ★

Another question on nonferrous casting prices concerns the proper regulation to apply to cast bushings and bearings. OPA has ruled that such parts are subject to MPR-125 unless they are machined, before sale, to such extent that the cost of machining exceeds 25 per cent of the total cost (including cost of machining), in which case they are subject to MPR-136 or MPR-452, depending upon their end use. Cast bushings which are finished products and covered by MPR-188 are exempt from MPR-125 regardless of the extent to which they are machined.

★ ★ ★

MORE than 13,760,000 workers had received special training for war production up to Sept. 1. This training has been carried on under six programs conducted or co-ordinated by WMC's Bureau of Training. Principal programs have been Vocational Training for War Production Workers with 6,756,339 enrollments; Food Production War Training Program, conducted through vocational agricultural schools, 3,207,205 workers; Engineering Science and Management War Training program, given in selected colleges, 1,583,256 workers; and Training Within Industry program which trained 1,440,494 men and women supervisors in about 1500 plants.

★ ★ ★

Chances are that many government-

(*Concluded on page* 210)

8 OUT OF 10 are repeat orders

Transite Core Plate Users come back for more!

HERE'S why Johns-Manville Core Plate changes one-time buyers into long-time customers:

Light Weight: Transite Core Plates light weight means easier handling, increased production.

Less Breakage: Their fibrous nature provides unusual shock resistance, minimizes breaking and cracking.

Easily Cleaned: Transite Core Plates are actually self-cleaning when both sides are used alternatively.

Economical: These J-M plates combine low initial price, low handling costs and long life.

Low Warpage: Maximum warpage on plates under 24" is 1/64" on either dimension. On plates over 24", warpage will not exceed 1/64" in 24" length and width.

Corrosion-Resistant: These Transite plates are made of an asbestos and cement combination. They cannot corrode.

Non-Metallic: No critical materials used.

Write for Brochure PP-10A. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

JOHNS MANVILLE PRODUCTS

Johns-Manville TRANSITE Core Plates

Easier TO USE

....that's why they choose AIR TOOLS

Here are several reasons why operators find air tools easy to handle:

- They are about one-half the size of other types of portable power tools. Consequently, they are lighter in weight. This means that operator fatigue is kept at a minimum.
- Air motors cannot be damaged by overloading. This feature, plus sturdy construction, assures trouble-free service.
- Workers can produce more work with less effort because air tools deliver more power per pound of weight.
- Power regulation permits the use of air tools on many kinds of materials and many types of operations.
- Starting and stopping are practically instantaneous. Air tools give maximum power immediately.
- Compressed air is the safest method for the transmission of power for portable tools. Air tools are safe.

Ingersoll-Rand

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Air Motors	Hoists	Rock Drills	Sump Pumps
Calking Hammers	Nut Runners	Sanders	Tampers
Concrete Vibrators	Reamers	Sand Rammers	Tappers
Drills	Rivet Busters	Scaling Tools	Wood-Borers
Grinders	Riveting Hammers	Spades and Diggers	Impact Wrenches

Industrial Air Compressors for Every Service

(*Concluded from page 208*)

owned war plants will be converted in peacetime into community manufacturing centers, locally owned and financed. Multiple industrial tenancy—sometimes known as "department store factories"—has been suggested to prevent war boom towns from becoming ghost towns.

★ ★ ★

SOME communities have been disturbed by government advertisements that local war plants are up for sale, the fear being that immediate shutdowns are in prospect. Actually, many DPC plants being offered for sale will not cease their war work until complete victory is a reality and the buyer will not be able to take possession until the armed forces' need for the output of those plants is satisfied.

★ ★ ★

Fears of some manufacturers that their future business will be hurt by disposal of government-owned machinery have been calmed somewhat. Some estimates are that not more than 25 per cent of such equipment will compete with new production, since much of it is of a special nature that cannot be utilized in civilian manufacturing. At the same time, both users and builders of many types of industrial equipment realize that the heavy grind of war production has moved up the replacement date of existing equipment by a good many years.

OFFICE of Surplus Property of the Treasury Department is revising its method of seeking buyers. A "Surplus Reporter" is to be issued from each regional office at regular intervals. This will advise firms on the Treasury's mailing list what property is for sale, where it is located and the general method to be used to sell it. The new system will discontinue the practice of automatically sending invitations to bid.

★ ★ ★

A new joint Army-Navy Termination Regulation covering all aspects of fixed price contract settlements has been completed. Agreement between the two branches on one set of rules and forms is expected to simplify and expedite the whole procedure of contract settlement and property disposition. The regulation, a loose-leaf publication of approximately 300 pages, is being sent to war contractors throughout the nation. Contractors not receiving it may request it from the Joint Termination Regulation Distribution Office, 90 Church street, New York 7.

★ ★ ★

SURPLUS War Property Administrator has issued the first installment of a "Handbook of Standards for Describing Surplus Property," prepared by WPB. Purpose of the handbook is to establish the minimum of information that should be supplied in listing surplus property. Use of the handbook information by contractors and subcontractors in reporting their termination inventories to their respective contracting agencies is expected to save time and labor in the disposal process.

★ ★ ★

An amendment to Priorities Regulation 24 eliminates the necessity for WPB authorization to place unrated purchase orders for machinery and equipment covered by the WPB orders on List A of the regulation. This includes foundry equipment. However, WPB has warned purchasers not to file applications for priorities assistance on orders for equipment needed for reconversion unless a case of great hardship can be established, since all other applications will be denied.

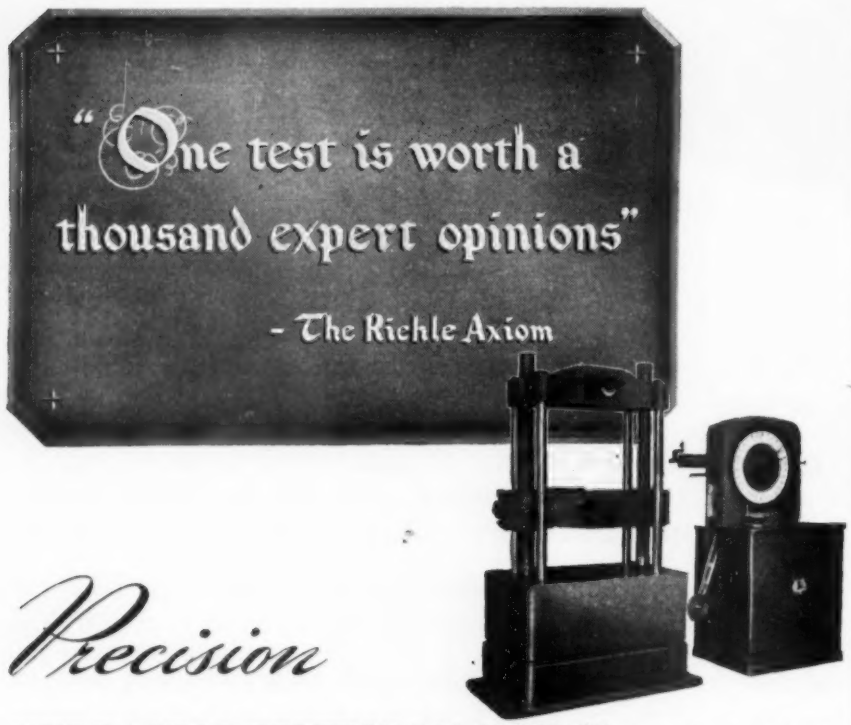
★ ★ ★

ALL restrictions on the manufacture of graphite crucibles have been removed by WPB through revocation of the order which previously prohibited the manufacture of certain listed sizes of standard crucibles and the manufacture of any type not being made at the time the order was issued.

W.G.G.

Rules on Gray Iron Prices Explained

For the purpose of giving gray iron foundries a better understanding of provisions of the OPA price regulation applying to gray iron castings, the Gray Iron Castings Industry Advisory Committee to the OPA is issuing a series of communications on the subject. These bulletins are being mailed to the entire industry through the courtesy of the Gray Iron Founders' Society.



Precision

HYDRAULIC TESTING MACHINES

. . . . have repeatedly demonstrated the practical truth in the words, "One Test is Worth a Thousand Expert Opinions." Because they have simplified the science of testing the physical properties of materials they are widely used throughout the wartime industries today. Here Riehle Testing Machines "ferret out" material weaknesses and defects; avoid failures before they occur. This technique of progressive testing on the production line and in research laboratories saves valuable machine and man-hours. Write for descriptive literature and quotations.

Pendulum load indication is more accurate and dependable because it operates on the natural laws of gravitation. This principle of operation is not affected by temperature changes or subject to metal fatigue. .

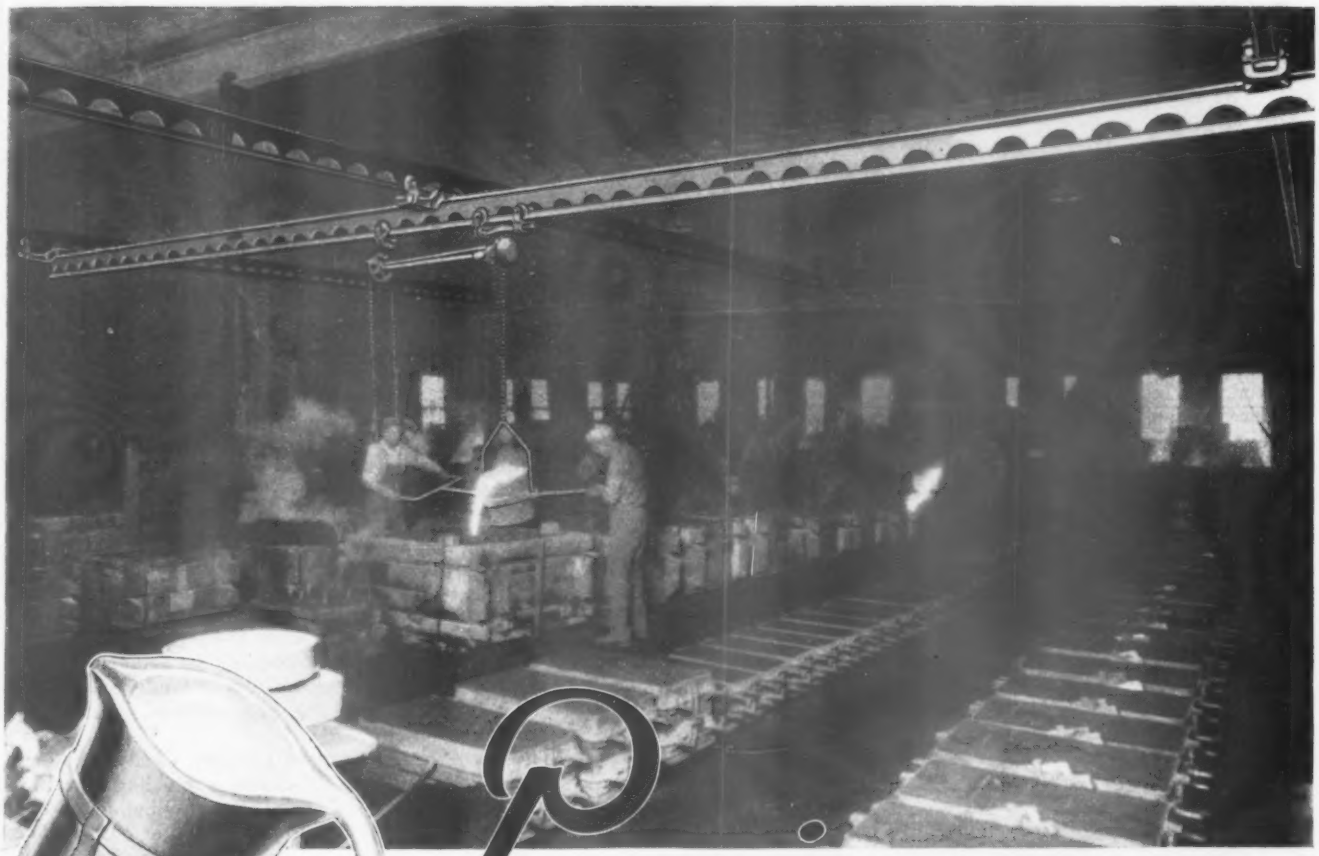
ARMY E NAVY

RIEHLE HYDRAULIC TESTING MACHINES

Riehle Testing Machine Division, American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

Other Products: IMPACT TESTERS • VICKERS HARDNESS MACHINES
BRINELL HARDNESS TESTERS • MEASURING INSTRUMENTS



Pouring . . .

FASTER, EASIER WITH CLEVELAND TRAMRAIL

If you are thinking about tomorrow, you are giving serious thought to various ways of improving your foundry efficiency, speeding production and cutting costs. You will find Cleveland Tramrail of profound interest because, for the cost involved, there perhaps is no other important foundry equipment that will yield as profitable returns.

Pouring is just one example. Metal is tapped into a ladle on a tramrail carrier at the cupola. The ladle is then taken directly to the mold and poured. No rehandling. No spillage. No hard work. The crane or carrier rides freely and easily on the smooth overhead track.

Cleveland Tramrail equipment permits taking the ladle over the shortest route from cupola to mold without hindrance from floor obstacles. The metal is delivered with minimum heat loss.

Likewise in the handling of cores, sand, molds and castings are important economies and advantages possible with Cleveland Tramrail. Hundreds of installations in small and large foundries attest to the soundness of the overhead method of materials handling.

Our sales engineers will be glad to survey your needs. Their ideas may spell the difference between profit and loss in the coming period.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

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THE CLEVELAND CRANE & ENGINEERING CO.
1155 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

INDUSTRY ...Briefs

ACE FOUNDRY CO., Chicago, which in early September moved from 1650 North Kostner avenue, to a new plant at 353 North Lamon avenue, is now building a one-story addition of approximately 5000 square feet to be used as the cleaning and core room. Completion is scheduled for about December 15. Henry J. Borre & Sons, 3808 West North avenue, Chicago, is the contractor.

Forest City Foundries Co., Cleveland, will remodel present building at West Ninety-fourth street and Maywood avenue and install foundry sand and mold handling equipment, dust collector, etc. Priorities have been granted for $80,690. Link-Belt Co. has contract for furnishing sand and mold handling equipment.

• • •

Presentation of the Army-Navy "E" award to the Scullin Steel Co., St. Louis, Mo., took place Oct. 31. The company has been manufacturing the 6-ton "earthquake" bombs effectively used against the battleship *Tirpitz* and on heavily protected Nazi submarine pens at Brest.

• • •

Orders for foundry equipment placed in September represented 388 per cent of monthly average sales in 1937-38-39, compared with 450.5 per cent in August and 346.6 per cent in September, 1943, according to the Foundry Equipment Manufacturers Association.

• • •

Southwest Foundry, Clearwater, Calif., has been granted a building permit for construction of a foundry building 20 x 40 feet, costing $2000, at 1254 West Rosecrans ave., Clearwater, Calif.

• • •

Maritime Brass & Bronze Works, San Pedro, Calif., has been granted a building permit for repairs and improvements to its foundry building at 1040 West Lomita Boulevard, to cost approximately $3000.

• • •

Macwhyte Wire Rope Co., Kenosha, Wis., has been awarded the Army-Navy "E" for the third time.

• • •

Empire Foundry Machine Corp., Ashland, Ky., has been incorporated by Eddie and Reta Green and J. E. Bruke, capitalized at $50,000.

• • •

Supreme Foundry Inc., West Allis, Wis. has been incorporated to manufacture castings and machinery by William Baumgardt and Associates.

• • •

Coast Pattern & Die Co. is the firm name under which Harry Leisenring and Peter C. Peters have published a certificate that they are conducting business at 65 North Raymond Avenue, Pasadena, Calif.

• • •

American Foundry Co., Los Angeles, is planning construction of a factory and office building, 30 x 80 feet, at Telegraph Road and Anaheim Avenue.

• • •

Master Foundry Co., 15019 Saranac Road, Cleveland, has plans for a one-story, 32 x 32-foot foundry costing $4000.

• • •

Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., has been author-

(*Concluded on page* 214)

Now ready! NEW FOUNDRY BENTONITE *Hand Book*

Pocket size. Leather cover. Contains tables, formulas and other reference data.

EVERY FOUNDRYMAN can profitably use this book ... which presents the experience of engineers who have specialized in Foundry sand. It contains recommended sand mixes, adapted to all types of gray iron, malleable and steel castings. Every mix presented has been thoroughly proved in practice.

Schundler Bentonite is strictly a laboratory controlled product and is especially "tailored" for Foundry use.

Schundler Bentonite is sold with a complete technical service fitted to your individual needs. This service is available upon request. Write today for your free copy of the new Foundry Bentonite Handbook.

F. E. SCHUNDLER & CO., INC.
520 RAILROAD STREET • JOLIET, ILLINOIS

SCHUNDLER
BENTONITE

Juniata

The UNIVERSAL FOUNDRY SAND

One of our several large deposits in Juniata Township, Banksand, Michigan, each of which has a different grain fineness.

JUNIATA bank sand has been adopted by an increasingly large number of foundries during each of the past 23 years, for use in cores, facing, and base molding sand.

CHEMICAL ANALYSIS

PCE—Cone No. 32	3092° F.	Ignition Loss	.65%
Silica	90.16%	Iron Oxide	1.18%
Aluminum Oxide	4.66%	Sodium and Potassium Oxides	2.77%
Calcium Oxide	.21%		
Magnesium Oxide	.10%	Titania	.27%

JUNIATA, WILMOT
AND
LAKE CICOTT
BANK SANDS
ARE
Exclusively
GREAT LAKES
PRODUCTS

Great Lakes
FOUNDRY SAND COMPANY—DETROIT
MINERS • PROCESSORS • FOUNDRY, METALLURGICAL AND SAND BLAST SERVICE

FOUNDRY SANDS • SILICA SANDS
SHOT—GRIT—BLAST SANDS
REFRACTORIES • BENTONITE
RE-BONDING CLAYS

(*Concluded from page* 212)

ized by Defense Plant Corp. to spend $170,000 for additional equipment at its plant there, bringing the overall DPC commitment to $2,270,000.

° ° °

City Brass Foundry, 152 Transit Street, Woonsocket, R. I. is having sketches prepared for a one-story, brick and steel, monitor-type plant to cost about $40,000, on Louisquisset Turnpike, Smithfield, R. I.

° ° °

Shipments of brass and bronze ingots during September by 55 producers totaled 38,333 tons, compared with 40,937 in August, according to the Defense Council of the Ingot Brass and Bronze Industry. This is believed to represent more than 95 per cent of the entire industry's deliveries.

° ° °

Diamond Pattern & Mfg. Co. is the firm name under which George L. De Land, Douglas H. Merchant and Joseph J. Simmer have published a certificate that they are conducting business at 8215½ South Vermont avenue, Los Angeles.

° ° °

Lubbock Foundry Co. is being established by Marvin W. Jordon in Lubbock, Tex., for the production of gray iron castings.

Century Pattern & Foundry Co. is the firm name under which David Altic and Ira W. Stockman have published a certificate that they are conducting business at 167 East Vernon avenue, Los Angeles.

° ° °

Continental Alloy Casting Co. has been incorporated to cast, roll, heat and forge machine castings, by A. H. Ganger, 340 East Ohio Gas Co. building, Cleveland.

° ° °

Fay Foundry & Machine Co., 1221 Broad street, St. Joseph, Mich., has been incorporated with $200,000 capital to manufacture metal castings and machinery, by Joseph E. Carver, 267 West Main street, Benton Harbor, Mich.

° ° °

Richmond Radiator Co., Uniontown, Pa., has purchased from Pierce, Butler Radiator Corp., Syracuse, N. Y., equipment for the manufacture of the latter's principal lines of boilers and radiators. The equipment is being installed in one of the Richmond Radiator plants and will be in production before the end of the year.

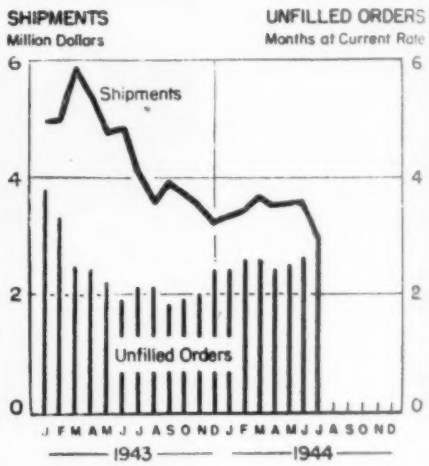
° ° °

Wilson Foundry & Machine Co., Pontiac, Mich., has been authorized by Defense Plant Corp. a $55,000 increase in contract to provide additional equipment at a plant in Pontiac, making overall DPC commitment $1,460,000.

° ° °

Production Pattern & Mfg. Co. is the firm name under which H. J. Langley and H. L. Bierley have published a certificate that they are conducting business at 3165 Slauson avenue, Los Angeles.

FOUNDRY EQUIPMENT, SUPPLIES



Shipments of foundry equipment and supplies totaled $3,027,000 in July, against $3,554,000 in June and $4,017,000 a year ago, according to WPB. Unfilled orders the end of July of $9,394,000 were practically unchanged from June but $318,000 larger than a year ago. Backlogs represented more than 2½ months shipments at the prevailing rate, highest since February, 1943.

TWO OF A KIND—

BOTH ACES!

SAHARA & REXALL

For elevating and conveying hot and cold materials respectively.

They possess these advantages for you:

PREWAR QUALITY!

PROMPT DELIVERIES!

PROVEN PERFORMANCE!

LOW ULTIMATE COST!

The FACTS are convincing; write for them!

IMPERIAL BELTING COMPANY

1750 S. KILBOURN CHICAGO 23, ILL.

STAND UP AND TAKE IT!

Federated *lead-base* alloys, particularly adapted for the heavy machinery employed in the logging and timber industry, are able to "stand up and take it" in today's continuous logging service. In fact, wherever wheels turn there is very likely a Federated lead base bearing alloy that will do the job. They offer these advantages:

1. Properties comparable to tin-base alloys
2. A method of application which prevents loose bearings
3. Easily lubricated
4. Resist fatigue at high temperatures
5. Highly stable
6. Cost 75% less
7. Available without priority

Order through your jobber or from the Federated office nearest you.

INGOT METALS AND WHITE METAL ALLOYS PRODUCED BY FEDERATED

ALUMINUM
BRASS
BRONZE
DIE CAST ALLOYS
SOLDER
BABBITT
TYPE METAL
ZINC DUST

All of these in standard specifications. Special alloys to your order.

FMD

Federated

METALS DIVISION

AMERICAN SMELTING and REFINING COMPANY

120 BROADWAY, NEW YORK (5) N. Y.

Nation-wide service with offices in principal cities

ACTIVITIES OF FOUNDRY GROUPS

(*Continued from page* 143)

every member to participate in the discussions and a large proportion availed themselves of the opportunity to ask questions and air their views. In fact, the time was all too short to hear all of those who wished to speak.

The Steel group discussed "Pattern Construction and Molding Requirements," and there was much discussion on the question of proper shrinkage allowances and factors affecting the actual shrinkage of castings which the pattern maker has to allow for.

G. D. Turnbull, Canadian Car & Foundry Co. Ltd., Turcot Works, opened the Cast Iron discussion with a very informative and practical talk on "Melting Practice and the Role of Raw Materials." This was followed by considerable discussion from members who had different methods of operating their cupolas.

The Bronze group started out with "Molding and Core Sands" and covered the field of both natural and synthetic sands in nonferrous foundries. The sand practice in several local foundries was outlined in detail and the effects of sand on foundry defects were described.

Discussion leaders were W. J. Brown, J. C. Kinsella, H. Louette, H. W. Bennett, A. E. Cartwright, A. J. Moore, C. V. Hacker and Wm. Seeds.

Reflecting the continued growth of the chapter, 11 new members were introduced. Plans are well under way for the National Officers' and Ladies' Night to be held in December. Directors authorized the investment of $400 from the chapter reserve fund in the Seventh Victory Loan, about to be offered.—*G. Ewing Tait, vice chairman.*

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Accuracy, rapidity, and reasonable cost characterize KAWIN FOUNDRY ADVISORY, METALLURGICAL, AND LABORATORY SERVICE. Tests available in unit or agreement basis. We invite inquiries regarding the manner in which this will fit into your operating program. Materials regularly tested for foundry clients are—

IRONS	ALUMINUM	COKE, COAL	MINERALS
STEEL	WHITE METAL	FUEL OIL	SAND
BRASS	BABBITT	FLUXES	CORE OIL

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Over 40 years' experience in all types of foundry work. Why not drop us a line and learn how we may serve you by our well rounded organization?

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Chemists—FOUNDRY ENGINEERS—*Metallurgists*

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Metropolitan

DISCUSSING metal patterns for high production foundries, Vaughan Reid, president, City Pattern Foundry & Machine Co., Detroit, before the Metropolitan Chapter of the A.F.A., Nov. 6, at Essex House, Newark, N. J., outlined what his company had been doing in the development of proper metal for aluminum and bronze castings, a problem he regarded as of considerable importance in pattern work.

He also emphasized the need for laying all details before a pattern maker in a proper and painstaking way, and in giving him the best of equipment and materials to work with. This, he said, is especially desirable, as pattern shop labor is expensive labor. Further, he stressed the importance of orderliness and neatness in the pattern shop to the end that everything may be found in the right place.

Special guests at the dinner, which was attended by 116 and with still others arriving later, included J. F. Kaiser, affiliated with the London plant of the Gillette Razor Blade Co., and a member of the London Chapter of the Institute of British Foundrymen. He extended greetings of his chapter and said that despite the war his group has been able to hold its meetings regularly—he said this with one qualification which was that they have been holding their meetings during the summer months instead of the winter months as usual, because of blackouts. Only once, he declared, were they at all disturbed at their meetings by bombings and this came only recently when a robot bomb came close and they all, as a measure of precaution, flattened themselves out on the floor.

Harry Reitinger, Emerson Engineers, New York, a national director of the A.F.A. and a member of the Chapter Contact Committee, spoke briefly on the aims of the latter group. T. D. Parker, Climax Molybdenum Co., New York, and chairman of the Metropolitan Chapter, upon receiving the report of the membership committee, revealed that the chapter was now fourth among all others of the association in point of new members. Horace A. Deane, American Brake Shoe Co., New York, and vice chairman, served as technical chairman.

Mr. Reid, in his discussion of the proper metal for aluminum and bronze

(*Concluded on page* 218)

AVAILABLE FOR STRATEGIC CASTINGS

PARASPRAY

SOON AVAILABLE FOR ALL CASTINGS

Porosity is eliminated and surface smoothness improved. These are but two reasons why PARASPRAY is used by large and small foundries watchful of costs and manpower hours.

Carbon black coating separating the metal and sand results when the hot metal decomposes the PARASPRAY without agitation or turbulence in the metal.

Knockouts made easier. PARASPRAY hardens core and mold surfaces, so less binder and lower green sand strength are required to resist abrasions during handling and assembly.

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PARASPRAY is a clear, easy flowing, readily "sprayable" liquid. It is made from rubber, chlorine and our special, highly volatile solvent known as PARASOLV. It is used to spray on cores and molds before the metal is poured. Ask for your test samples.

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PARASET CORE BINDER

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(*Concluded from page 216*)

castings, pointed out that his company has been doing considerable research for a long time in an effort to find an aluminum that would provide the best machine qualities, as well as have a good abrasive resistance. The aluminum that his company is now using consists of 3.50 to 4.50 per cent copper, 2.50 to 3.50 per cent silicon, 1 per cent maximum of iron, 0.30 per cent maximum manganese, 0.03 per cent magnesium, 0.20 per cent maximum zinc, 0.20 per cent maximum titanium, and the balance aluminum.

Metal of this analysis, he said, is proving to be a very flexible aluminum alloy for patterns, coreboxes and drier castings. It has good casting characteristics and has a much higher elongation than the conventional No. 12 aluminum, which in the past has been used principally for making pattern castings. Good elongation is highly essential, he added.

The speaker also pointed out that this alloy is subject to an age-hardening process, which is accomplished at room temperature. Advantage of this feature, he said, is that the metal pattern can be machined and the necessary work done before it attains its maximum hardness. This age-hardening process takes approximately two weeks.

After aging, the hardness of this aluminum will run approximately rockwell E-75; whereas the approximate hardness of No. 12 aluminum is rockwell E-65. This same age-hardening characteristic works out very well in the manufacture of aluminum core driers. After the driers are cast, Mr. Reid stated, they are heated to a temperature of 960 degrees Fahr. and water quenched. The driers then are in a wholly annealed state and can be fitted to the corebox and slug where they may be straightened and worked easily.

After being properly fitted, the core driers automatically will become hard upon use in the core oven. It is important, however, to work the driers as quickly as possible after the quenching operation in order to obtain maximum workability. In the event the driers are not to be used in the pattern shop immediately, it would be best not to give them the 960 degree temperature water quenching until the operator is ready to use them. In the melting of this aluminum alloy any chloride flux can be used satisfactorily, he added.

Some patterns are required to be made of bronze, and many loose pieces should be made of bronze. In searching for the proper metal for this type of work, Mr. Reid said his company found that a chromium copper, a nickel silicon copper or a beryllium copper alloy was best suited for this type of work. The chromium copper alloy provides a hardness of rockwell B-60, the nickel-silicon alloy a hardness of B-75, and the beryllium copper alloy a hardness of C-40.

Advantage, he said, to be obtained by using this type of alloy is that it can be annealed, and after the annealing it may be machined and then hardened before completely finished. This hardness is especially desirable where extraordinary wear is to take place. In a corebox to be used on a core blowing machine or in a projecting boss in one of these coreboxes when it is located where the sand will strike, it will be found that this box made of beryllium copper will stand up much better than any other material.

Mr. Reid presented a number of slides showing views in his plant and illustrating various types of patterns produced.—*Ben K. Price*

Ingenious New

Technical Methods

Presented in the hope that they will prove interesting and useful to you.

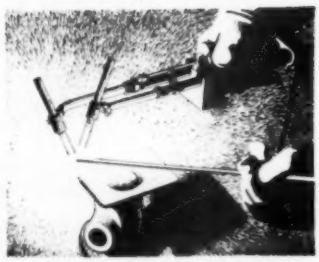
New 9000° Arc Torch Can Be Used for Welding and Brazing All Ferrous and Non-Ferrous Metals and Alloys

Now an arc torch that makes it possible to do most jobs *electrically* that previously were thought possible only with gas. This attachment for arc welders provides an independent source of heat by means of two carbons. It is capable of producing intense heat, approximately 9000° F., over 2000° hotter than an oxyacetylene flame. Pure heat, no oxygen or gas to contaminate the weld. No pressure to force the molten metal away or blow holes in light sections.

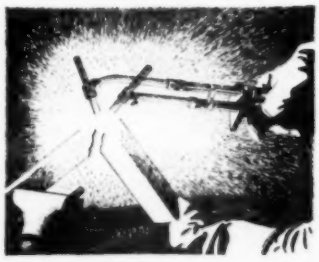
Developed to capitalize to the fullest on the time-saving advantages of electric welding, the new Mid-States 9000° arc torch can be used with any AC or DC electric welder. It opens up new horizons of service in this field, never before possible with an electrically operated instrument.

New uses are being found every day for products that have been familiar to us for years. Wrigley's Spearmint Gum, always enjoyed for its chewing satisfaction, is now proving with the fighting men overseas many benefits which will be useful to you in peacetime. One of the big factors in mass production is the alertness and efficiency of the man on the job. The chewing of Wrigley's Spearmint will help keep you alert and wide-awake during those work periods that, while seemingly dull and monotonous, call for watchfulness in order to get perfection in the final assembly.

You can get complete information from Mid-States Equipment Co., 2137 S. Wabash Avenue, Chicago 16, Illinois.



For BRAZING Steel, Cast Iron, Malleable Iron, Copper, Brass, Bronze, and other ferrous and non-ferrous metals.



For HEATING to Straighten or Bend, etc.

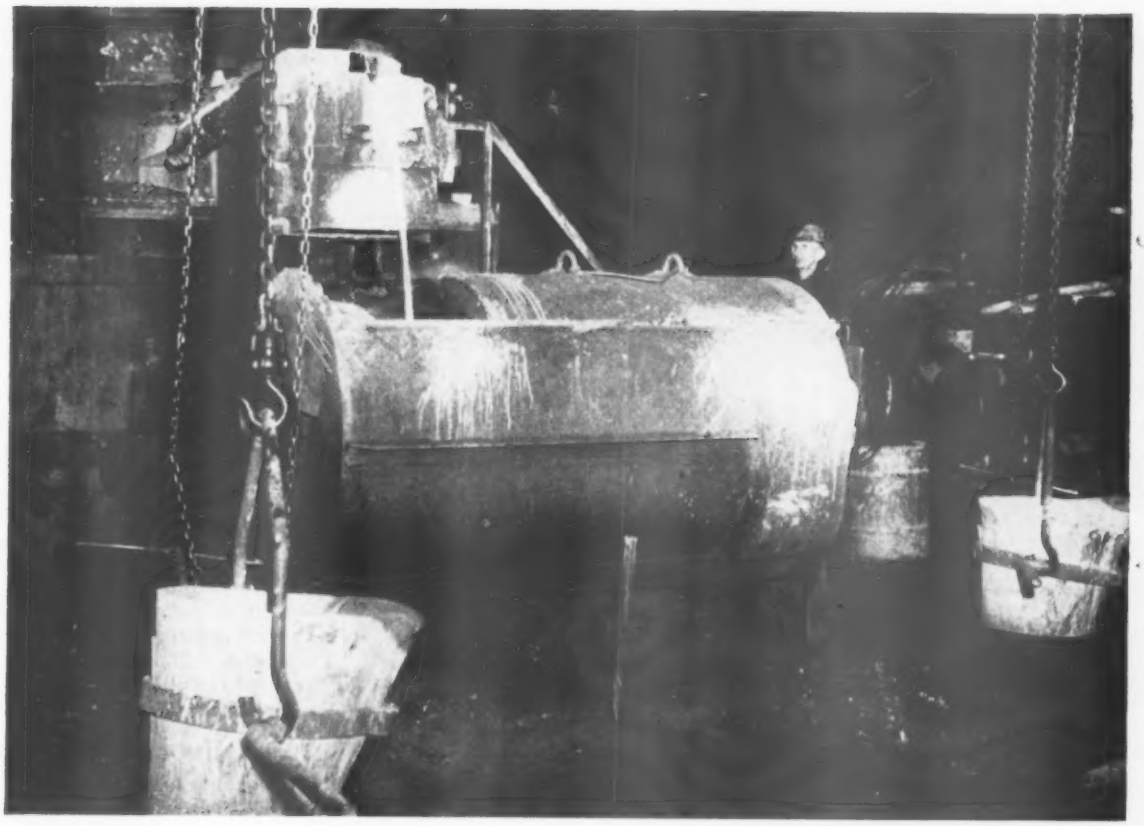
Y-168

National Malleable Veterans Organize

Cleveland Works chapter of the newly formed Naco Service Society, consisting of National Malleable & Steel Castings Co. employes with service records of 15 years or more, was organized at a banquet Oct. 21 at the Cleveland Club.

Qualifying for membership in the chapter are 298 employes of the Cleveland Works, including nine who have been with the company over 50 years. They are Mark Kuehn, James Guda, John Lisy, Frank Myer, Enoch Collier, James Moravec, Fred Furniss, Louis Michael and Henry Oehling. Mr. Lisy, a coremaker who retired last year after 59 years with National Malleable, and Mr. Oehling, a core department supervisor with 57 years of service, boast the two longest records.

"IRONTON NOJOINT"



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"Ironton Nojoint" plastic ramming refractory was developed especially for lining desulphurizing, mixing and receiving ladles. This product gives a solid, dense, monolithic lining and there can be no premature failure due to the corrosive action of soda slags. Fire brick linings fail on account of the action of alkaline slags on the brick joints.

"Ironton Nojoint" is easily and quickly installed. We supply complete instructions for its use and offer you the assistance of a service man in installing the original lining and training your men to do the job properly.

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THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

Improved Method of Compounding

MOLDING MATERIALS

By HARRY W. DIETERT
Harry W. Dietert Co.
Detroit

TO OBTAIN better castings it is proposed that a new method be used to select and proportion the ingredients in molding materials, such as facing sands, cores and washes. Since the boundary of each casting made in a sand mold is determined not only by the sand of the mold or core but also by a gas envelope as well, it is expedient that foundrymen recognize the importance of the composition and pressure of this gas envelope which surrounds the molten, solidifying and cooling metal in a mold. It is insufficient to specify the room physical properties even though they are important.

SYMBOL of SERVICE
Since 1890
★ Long before the term "expediter" came into general use, we of Hickman, Williams had "expedited" countless industrial transactions. But, more important, we have been relied upon throughout these years to help solve problems dealing with ferro-alloys, pig iron, coal, coke, shot and grit
★ Yes, for more than 50 years we have taken pride in the fact that when we are called upon, our customers expect and get action!
Call on us at any time. We are anxious to demonstrate our ability to serve you.
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The first task in compounding a new facing or core mixture is to develop the mix to produce a specified hot gas pressure and provide a definite chemical reactivity, for example reducing, inert or oxidizing.

The combustible materials, such as sea coal, pitch, coke, cereal, molasses, sugar, oils, resins, wood flour, urea, asphaltic materials and others that are placed in molding materials, produce a facing effect on the casting surface due to the hot gas pressure developed and due to semieffective reducing type of atmosphere.

The oxidizing materials in molding materials are as follows: Moisture, chemically combined water, air in the voids of the sand, air in the mold cavity, steam and carbon dioxide which are produced in the combustion of the combustible facing materials.

The hot gas pressure created by a molding material at a given pouring temperature for a given quantity of metal depends upon: 1. Rate of gas evolution; 2. Quantity of materials in the mix that will liberate gas at elevated temperatures; 3. Permeability of the molding materials; 4. Heat conductivity of the molding material.

All of these factors affect the hot gas pressure. Thus, when one uses the hot gas pressure test as made in a dilatometer, all of the previously mentioned factors are measured and taken into consideration. The hot gas pressure test is very easy to make and also easy to apply in practice.

Has Affinity for Gas

A second important index of a molding material is the type of gas that it will liberate at pouring and cooling temperatures. The hot metal in a mold presents a large surface area to the gas envelope that surrounds it in a mold. Hot metal has an affinity for many of the hot gases as found in a mold. In the case of steel or iron some of the detrimental gases are oxygen, air, carbon dioxide, sulphur dioxide and steam. Thus, the gas envelope should be sufficiently reducing in nature so as to absorb oxygen readily at temperatures from 1000 to 3000 degrees Fahr. and be capable of absorbing the super-heated steam. Again, the gas envelope may be one that displaces these harmful gases from the face of the casting in the mold. This displacement also may be accomplished by an impervious skin or glaze between the metal and gas envelope.

The advanced technique of compounding molding materials is to use the hot gas pressure test and the chemical reactivity test, as made in the dilatometer, as the functioning index test for a molding material. These tests would be used not only in the original compounding of a mix but would be used as well in the daily check tests to determine whether the mix has been correctly prepared. Any small change in the ingredients, whether it be as to quality or quantity of the ingredient, will be determined quickly and conclusively.

(*Concluded on page* 222)

by assuring MORE PRESENTEE-ISM

KIRK & BLUM DUST and FUME CONTROL HAS MADE A SUBSTANTIAL CONTRIBUTION TO *Victory*

Workers who breathe clear, clean air, free of harmful dust and fumes, are far less susceptible to common or occupational diseases . . . far less apt to join the ranks of temporary or permanent "absenteeism." These "presentees" are not only more consistently on the job—they do a more consistently better job.

This is *fact*—proved throughout our period of intensified war production just as it had been previously proved in peace time. The evidence speaks for itself, in the hundreds of plants equipped with efficient dust and fume control systems designed and installed by Kirk & Blum "air engineers."

Kirk & Blum systems are backed by 37 years of specialized engineering experience.

Designed to meet individual plant requirements, they guard workers' health . . . increase man-hours and man-efficiency . . . retard deterioration of machinery and other equipment . . . step up production and lower costs.

In modernizing present equipment or planning for reconversion, you'll be wise to follow the example of leading industries everywhere—by getting the unbiased counsel of K & B "air engineers" on all problems of dust or fume control.

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Dust Collecting Systems in Metal Industries
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Industrial Ovens
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Data on Kirk & Blum Production Facilities

The KIRK & BLUM MANUFACTURING CO.
2808 SPRING GROVE AVE. CINCINNATI 25, OHIO

KIRK AND BLUM

(*Concluded from page 220*)

Under this system of sand control the green, dry and baked strengths together with green deformation and flowability, are used as check tests on the handiability index. The base, green, or baked permeability tests are used as a quick fineness index.

The hot collapsibility, hot strength at 2, 4 and 12 minute immersions, and spalling tests are controlled at values suitable for a selected group of castings.

The entire system of control is predicated upon a sand preparation installation where all of the ingredients entering the mixing units are accurately weighed.

Backlogs of Machine Tools Still Heavy

Backlogs of the machine tool industry at the end of September would require 5.4 months to fill at the prevailing shipping rate, according to WPB. September shipments of $35,876,000 were 2 per cent ahead of August, while new orders amounted to $33,013,000 and unfilled orders totaled $193,682,000. Less than 5 per cent of backlogs represented unrated orders.

Allen Billmyre Co., Mamaroneck, N. Y. has appointed Johnson & Scott, Memphis 3, to handle sales of its blowers, exhausters, vacuum cleaning systems and other products, in the state of Tennessee.

Honors 12 Veteran Employes

In a commemorative dinner and celebration, the men and management of American Engineering Co., Philadelphia, honored 12 of the company's oldest employes, Oct. 26. Benjamin Smith, 81, who had completed 65 years as a machinist, was the oldest employe in point of service. Five of the men, Leonard Schmidt, Lorenz Stahle, George H. James, John Yerkes and William A. Vandergrift, have been identified with the company's foundries for 40 years or more. Presentation of gifts and War Bonds marked the occasion.

Functions of Federal Agents Listed

A descriptive tabulation of 428 functional units of the government is contained in a booklet, "Federal Agencies," published by the Citizens National Committee Inc., 1409 L street N. W., Washington 5, and available at 25 cents. Although intended primarily to provide citizens with an understanding of postwar problems of government reorganization, the booklet's tabulations of the various bureaus and agencies make it valuable as a government guide book.

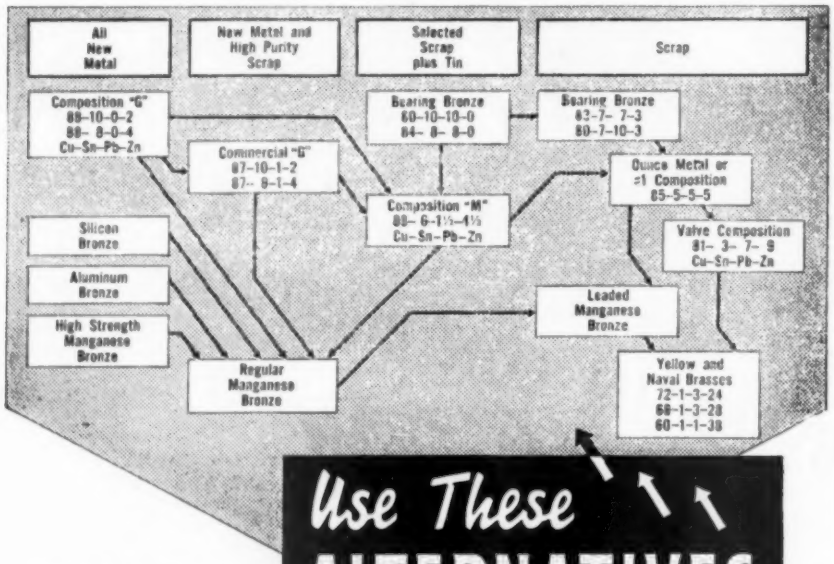
Foreman's Guide on Labor Published

"Foreman's Guide to Labor Relations" is the title of a booklet prepared by the U. S. Department of Labor, Division of Labor Standards, Washington. It is intended to help the foreman develop a constructive and flexible approach to the human problems he meets daily, also to give him a better understanding of his position as management representative in applying the company's labor relations program.

Output of Malleable Castings Higher

Production of malleable iron castings in August totaled 74,297 tons, against 61,320 in July, 67,615 in August, 1943, and 56,304 in August, 1942, according to the Department of Commerce. Production of 578,871 tons the first 8 months compares with 553,371 and 513,760 in the corresponding 1943 and 1942 periods, respectively. August bookings, less cancellations, totaled 77,908 tons, against 106,626 in July and 108,505 a year ago.

Walsh Refractories Corp., St. Louis, has opened a Chicago sales office in the Midland building, 176 W. Adams st., under the direction of William K. Schweickhardt.


All New Metal
New Metal and High Purity Scrap
Selected Scrap plus Tin
Scrap
Composition "G" 88-10-0-2 88- 8-0-4 Cu-Sn-Pb-Zn
Commercial "G" 87-10-1-2 87- 9-1-4
Bearing Bronze 80-10-10-0 84- 8- 8-0
Bearing Bronze 83-7- 7-3 80-7-10-3
Ounce Metal or =1 Composition 85-5-5-5
Composition "M" 88- 6-1½-4½ Cu-Sn-Pb-Zn
Valve Composition 81- 3- 7- 9 Cu-Sn-Pb-Zn
Silicon Bronze
Aluminum Bronze
High Strength Manganese Bronze
Regular Manganese Bronze
Leaded Manganese Bronze
Yellow and Naval Brasses 72-1-3-24 68-1-3-28 60-1-1-38

Use These **ALTERNATIVES** *Wherever You Can*

Notice how the arrows on the W.P.B. chart point to the *right*. . . . They show how alternative materials *currently available* can be utilized by foundrymen as now permitted by many designers. The purpose is to conserve primary metal at the mine through increased use of secondary ingots. Sometimes great ingenuity is called for, yet remember this:

The first program for scientific control of ingot metal was set up by Ajax 45 years ago. The result has been metal and practical technical follow-through in which Ajax increases your production by reducing rejects.

Send for booklet
"INGOT METALS OF TODAY"

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16 STANDARD INGOT METALS BY AJAX

Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax High-Tensile Manganese Bronze
Ajax Golden Glow Yellow Brass
Ajax-Hamilton Gear Bronze
Ajax Nickel-Copper 50-50%
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE

•"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

THE **AJAX METAL COMPANY**
ESTABLISHED 1880 PHILADELPHIA

ASSOCIATE COMPANIES:
AJAX ELECTRIC FURNACE CORP. Ajax-Wyatt Induction Furnaces for Melting
AJAX ELECTROTHERMIC CORP. Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC. The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ENGINEERING CORP. Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces

WAGE INCENTIVE PLANS IN FOUNDRIES

(*Continued from page* 79)

together without control of their individual shares in the work.

The plant-wide plan based on the total production per man hour of the entire plant and shared by all the employes attracts many companies because of its simplicity of installation and operation, but it is usually the least effective in increasing productivity.

Incentive wage plans may also be divided into types by means of the methods used in establishing the standard or base productivity. Time study is the soundest method for setting standards and is recommended wherever practicable. Past performance records also may be used in determining standards, but should cover comparatively long periods of operation under all normal variations of conditions. It must also be remembered that productivity in past performance is merely what was obtained, not necessarily what should have been obtained. Other bases for standards, such as budget labor costs, etc., should be used only in unusual cases and with extreme care.

Conditions Cause Variations

The participation, or percentage of wage increase for each 1 per cent increase in productivity above the incentive starting point, may be different in various types of plans. If the plan is based on well engineered time-studied standards and the incentive starting point is at standard or 100 per cent productivity, the incentive pay may well be 1 per cent for each 1 per cent increase in productivity. When these conditions are not met, when average past performance without increase is used as standard, when production is not definitely stabilized, or when other uncertainties exist, the incentive may be set at something less than 1 per cent for each 1 per cent increase in productivity above the incentive starting point.

Sometimes it is desired to put indirect workers on an incentive wage plan. This calls for careful consideration. Wherever possible, standards should be set also for these employes either by time-study or from well-established past performance records. Where this is not practicable it is possible to approximate the productivity of the indirect employes by the relation of the indirect time-taken hours to the total production of the plant as measured by the time-allowed hours or standard hours of the direct workers. It should also be remembered that the relation of the indirect time-taken hours to the direct time-allowed hours should not be constant but should vary with the degree of activity of the plant, for it requires more indirect labor per unit of production at lower plant activity.

Examples of possible applications of wage incentive plans to different kinds of foundries follow. These are merely suggestions and may be varied to suit particular conditions.

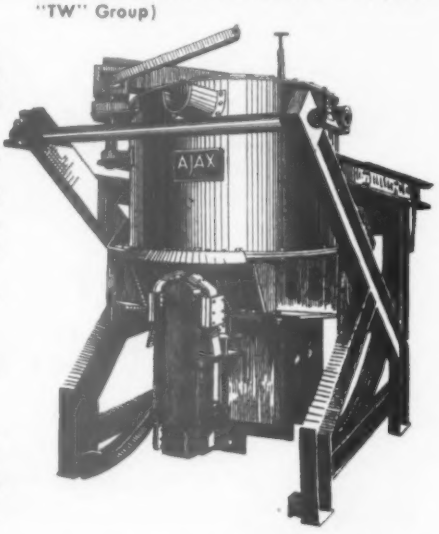
In production foundries where there are many castings made from the same pattern, it is comparatively easy to set standards for the direct workers by time study or well established past performance records. The plan may be for individuals, groups, or both. Most of the indirect workers can be tied in with the total production of the groups to which they are attached. For example, it may be found that 2 truckers working 8 hours each are required when 10 molders work 8 hours each at a productivity of 100 per cent. This means 16 man-hours of trucking can be taken as standard for a production of 10 x 8 x 1.00 or 80 time-allowed molders' hours. Now if the number of man-hours of trucking, or the number of man-hours of molding, or the productivity of the molders is changed the productivity of the truckers will vary accordingly.

Where the number of castings from a pattern is small, as in jobbing foundries, it may not be practicable to make time studies. There are several possible ways of determining standards in such cases. The patterns may be sufficiently similar so that small allowances for differences

PLANTS NOW MELTING ALUMINUM ALLOYS ELECTRICALLY ENJOY THESE SPECIFIC ADVANTAGES...

1. VASTLY INCREASED PHYSICALS (tensile strength and elongation) in foundry, die-cast, or rolling mill products.
2. DECREASED GAS ABSORPTION AND SEGREGATIONS hitherto due to conventional melting practice.
3. CLEAN-CUT, ACCURATE TEMPERATURE CONTROL during the melting and pouring stages.
4. GREAT EASE AND SIMPLICITY IN HANDLING ALLOYS that were once considered sensitive and difficult to melt.
5. ELIMINATION of oxide inclusions.
6. COOL AND CLEAN foundry operations.
7. DELIVERY of the rated production per hour on the hour, (production capacity 300 lbs. to 1250 lbs. per hour).

This is the first commercial electric furnace for melting aluminum alloys in continuous operation. It utilizes the famous Ajax-Wyatt low-frequency induction melting principle which has been applied successfully for nearly all wrought brass melted throughout the world. Write for new bulletins . . . (The "TW" Group)



AJAX ENGINEERING CORPORATION, Box 1418, Trenton 7, N. J.

THE AJAX TAMA-WYATT INDUCTION MELTING FURNACE

ASSOCIATE COMPANIES: AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

may be made. In rare cases the amount of work required may be closely related to the weight of the casting, and tonnage can be used as a standard unit, but this is not often true.

For jobbing foundries probably the best means of setting standards is to establish either by time study or past performance records the time required for each operation entering into the production of a casting. These operations or elemental standards cover the various possible operations under conditions existing in the plant and may be tabulated as, for example: Squeeze molding, 0 to 1000 cubic inch flask, no bars, no facing —1.50 minutes; vents—.030 minutes each: set cores, small—0.30 minutes each; etc. A table of time allowed should be made for each operation; for example, under molding would be the various time allowances for each type of molding and for each size of flask. Similar tables can be prepared for coremaking, shaking-out, cleaning, grinding, etc.

Whenever a new job is received the standard time can be calculated by referring to the tables of operational standards, taking off the time allowed for each operation required on the new job and totaling these time allowances. The molding, coremaking and other departmental time will be obtained as subtotals.

Most of the work in this method lies in preparing the tables of operational standards and is not as formidable a task as it seems. There are a limited number of elemental operations and by proper tabulation to fit shop conditions the task may be simplified. The following table, for the conditions in a certain foundry, is given to show the setup for one operation.

SQUEEZE MOLDING
(Time Allowances in Minutes)

Flask size	Facing	No facing
12″ round	.51	.43
12″ square	.56	.47
14″ round	.57	.48
14″ square	.62	.53
16″ square	.68	.58
12″x16″ square	.62	.52
Vents, ea.	.030	
Gates and risers, ea.	.10	
Unmounted pattern, extra	.33	
Set cores, small ea.,	.045	
med. ea.	.08	

At present in foundries throughout the United States many methods of setting standards are in successful operation. Some, but not all, of these will be summarized briefly to show possible approaches to the setting up of wage incentive plans.

a. For molding and core-making, time studied standards are most common. In instances when this is not practical due to the variety of patterns and short runs, standards are sometimes set by adjusting the time allowances for similar patterns. If there is not enough similarity of patterns, standards can be set by the addition of time allowances from tables of operational or elemental standards as discussed above.

b. Shakeout crews frequently are paid on standards based on the size of the flask. If much handling of the casting is involved, its tonnage may also become a factor.

c. Cleaning and grinding of castings can be based on standards related to the area chipped or ground and the nature of the material removed, whether fins, nails, or sand. The burning of gates and risers can be based on size.

d. Pouring standards can be based on the total tonnage poured multiplied by a factor taking into account the number of molds poured.

e. Melting operations frequently have standards set on the tonnage melted, sometimes involving the use of a quality factor where this is within the control of the employe.

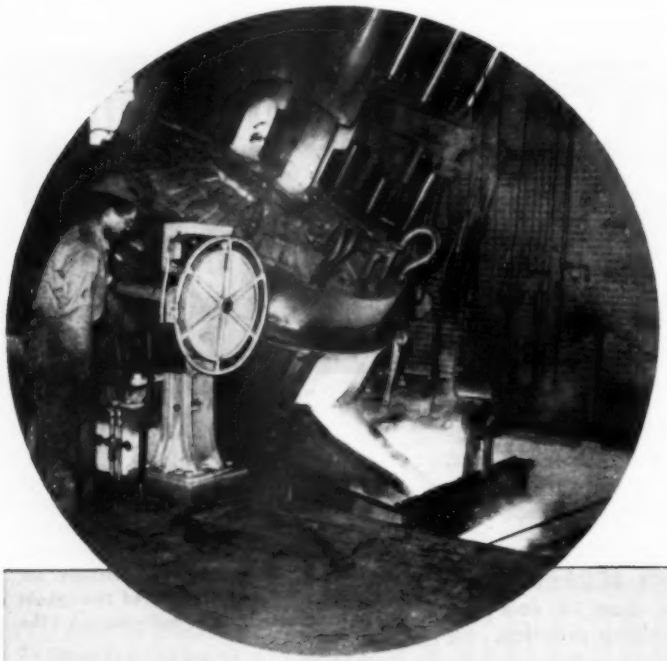
f. Flask and raw material handling can be on a tonnage or piece basis.

g. Pattern shop work can be on a time studied or elemental standard basis, but is usually not on a separate departmental incentive plan.

h. Heat treating can be on a tonnage standard modified in some cases by the weight of each casting or on a furnace load base.

i. Ladle lining can easily be put on standard time allowance for each size of ladle. Furnace lining and repairing may depend on furnace size and type, modified by the amount of lining or patching material required.

(*Concluded on page* 226)



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(*Concluded from page 224*)

j. Helpers generally are included in the groups with those they help.

k. Maintenance men, if assigned to definite production departments can be placed on a fixed number of hours as a standard for a given total production in that department. If not attached to definite production departments, they can be paid on the basis of the hours they actually worked as this is related to the total production of the plant, remembering that this relation is not constant for all stages of plant activity.

l. General labor can be treated in the same way as helpers or maintenance men.

m. Supervision incentive pay is often dependent on departmental productivity, modified by number of employes supervised, material and supply costs, scrap losses, etc.

The foregoing discussion refers to incentive wage plans of the group or individual class. In case a plant-wide plan is adopted the measure of productivity is the total production divided by the total man-hours required. Total production can be measured by the total time allowed or standard hours allowed for the units produced, by the tonnage produced, or by the number of pieces or units produced. As stated before this overall type of plan usually is not as effective as other types. It also requires that great care be used in choosing units and standards that truly reflect the effort required in their production.

In all cases quality should be protected by payment for good castings only. Inspectors can be on incentive pay based on the number of pieces inspected and the absence of subsequent rejections. In some cases the inspectors are not under shop supervision.

It will be seen that there are innumerable combinations of the methods discussed which may be utilized. In general, the more carefully the incentive plan is set up and the more attention it is given the better it will function. The additional time and expense necessary to operate a sound wage incentive plan is repaid by increased productivity with increased earnings for the employes and no increase in unit labor cost. However, foundries which are not ready to do a proper job would do well not to try incentive wage plans, for they are powerful forces for either good or evil.

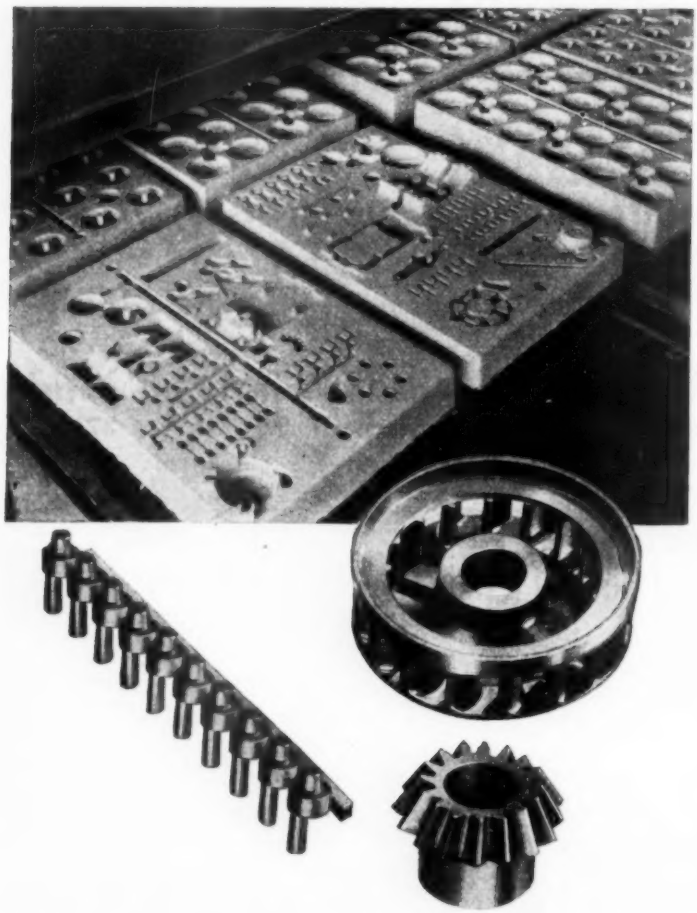
Book Review

Patternshop Organization and Management; by A. H. Squire; 175 pages 5x7½ inches; with 67 illustrations and diagrams; published by Charles Griffin & Co. Ltd., London.

This is No. 13 in a series of industrial text books written by authors actively engaged in or controlling the work. All the books are written from the practical view point. In a foreword the present author, a prominent foreman patternmaker, states that the book was written primarily for the benefit and information of young ambitious patternmakers seeking promotion to positions of responsibility. He points out very sensibly that it is useless to look for an executive post without being prepared for the opportunity. Phases of the subjected treated under 12 chapter headings include: To the enterprising journeyman and apprentice; to the employer and works manager; organization of the patternshop; planning; patternshop mechanization (This is the longest chapter in the book, 61 pages covering all types of wood working machines); utilizing non-patternmaking machines; upkeep of cutters, saws and machines; pattern shop layout; metal patternmaking; pattern storekeeping; timber storekeeping; to patternshop foremen. An index at the back of the book makes for ready reference.

Core, Molding Sand Film Available

Harry W. Dietert Co., Detroit 4, has available for use by interested societies or groups a motion picture entitled "Behavior of Cores and Molding Sands at Elevated Temperatures." The 16 mm. film, in color, consists of four reels and will be loaned with or without projector and screen. Dates and other details readily may be arranged.



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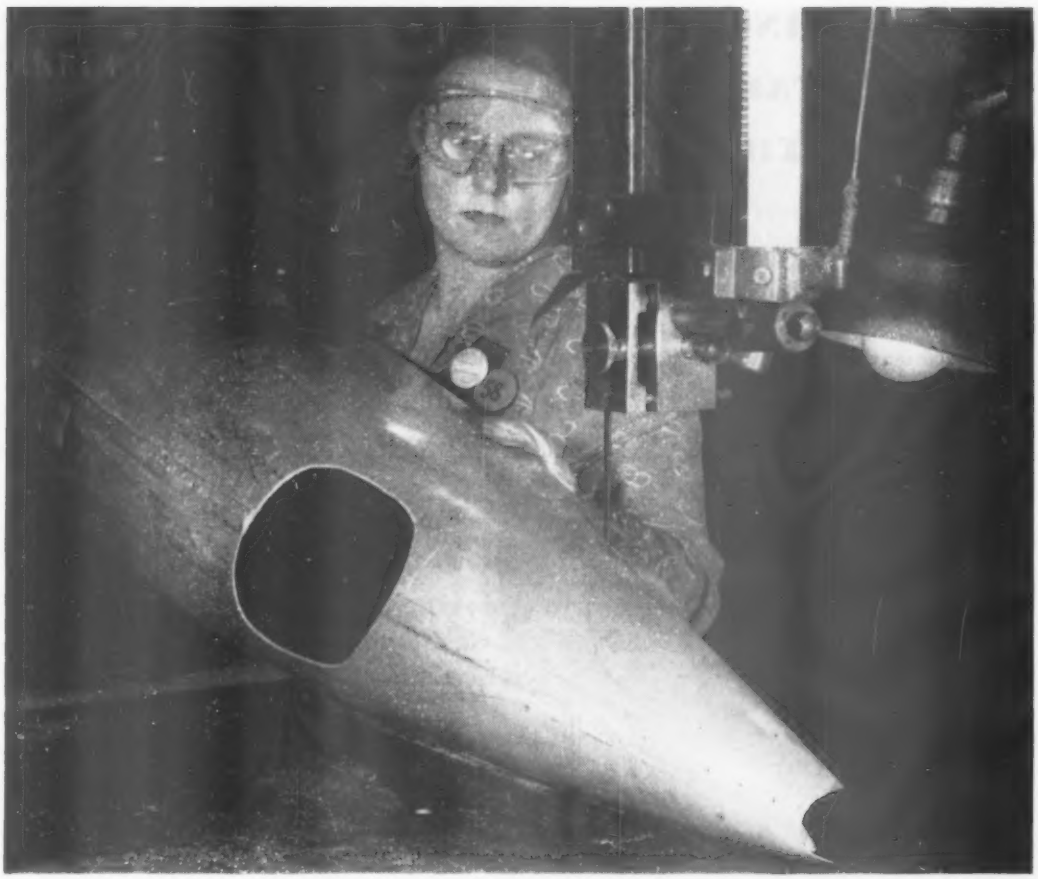

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RETAINING PHYSICAL PROPERTIES

(*Continued from page* 93)

should be in sufficient quantity to secure a brinell high enough after the quench to require a 1000 to 1200 degree Fahr. draw for 4C2 and 4C3 classes. The draw is almost necessary to give the casting good ductility with medium high strength. If the draw ovens are not of the recirculating type, a draw lower than 1100 degrees Fahr. will cause trouble.

2. Correct Deoxidants and deoxidization practice. Aluminum is the chief deoxidant used by steel foundries, especially those pouring steel into green sand molds. WPB limits the amount of aluminum per ton of steel to 2½ pounds for deoxidation purposes. This meant a drastic cut to some steel foundries as they were using 3 and 4 pounds per ton of melted steel.

Aluminum when placed in contact with the metal must not be contaminated with the slag. If it does become contaminated with the slag some of the deoxidizing power of the aluminum is lost to the slag and the inclusions may go into the class II type from which no amount of alloys will ever make good steel. Using only 2½ pounds of aluminum per ton of steel one must make sure there is enough residual aluminum left in the steel to insure a class III type of inclusion[1] by adding the aluminum correctly.

Additional deoxidants, exclusive of aluminum have been tried and are being used quite successfully today in many steel foundries. These deoxidants are used in conjunction with aluminum.

A suggested way of making sure the aluminum gets into the steel is to have a rather small tap hole on the electric furnace and to tilt the furnace forward fast enough while tapping the heat so that the slag-metal line is always above the tap hole. This type of pouring a heat from the furnace copies the action of a bottom pour ladle. The slag is the last to leave the furnace and by that time aluminum is already in the steel. The aluminum may be plunged into the clean, slag-free steel when about one-third of the heat is in the ladle, as there is no slag on the metal at that time by following the above directions.

More heats can be spoiled even with all the alloys possible if the job of placing the aluminum in the steel is not thoroughly understood by the man who actually does this work.

3. Heat Treatment. If items 1 and 2 are watched carefully the heat treating becomes a matter of routine after the first trial castings are put through the heat treating department. The quenching of 4C2 and 4C3 castings should be drastic enough to obtain over 300 brinell and still not be drastic enough to quench-crack the castings. Water is used sometimes in place of oil as the water provides a more drastic quench so that less alloys may be used and still produce the desired results.

Time and Temperature Vary

The writer prefers to normalize castings at 1700 degrees Fahr. for 3 to 4 hours at temperature, the time at temperature being in accord with metal sections, and then cooling to room temperature before heating again to 1600 degrees Fahr. for 2 hours at temperature prior to quenching in 100 degrees Fahr. water. Some heat treaters take the liberty of a short cut and quench from the first normalizing temperature. There are pros and cons for both methods but the writer believes lower molybdenum content is necessary when using the longer method of heat treating. A finer grain size is developed by reheating to 1600 degrees Fahr. after a higher temperature of normalizing than by only one normalizing prior to quenching.

Some foundries prefer a quench following the draw instead of allowing the castings to cool in still air. The draw-quench does not change the brinell hardness or tensile properties of the castings over those vhich are drawn and air cooled. The brinell hardness and physical properties, with the exception of impact, are the same for either final

(*Continued on page* 230)

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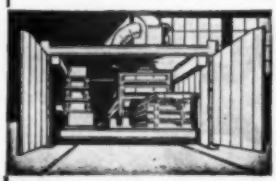

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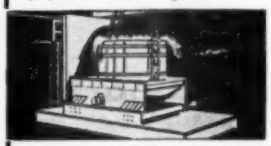

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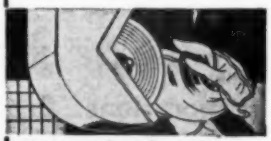

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(*Continued from page* 228)
process which is followed.

In attempting to decrease the molybdenum content in steel castings for the classes, 4C2 and 4C3, the three foregoing items were kept in mind in the following tests. Nine 4000-pound heats were made and the chemistry, heat treatment, deoxidants, and physical properties are listed in Table I.

Test No. 1. The molybdenum content was dropped from the normal 0.36 per cent down to 0.26 per cent. The deoxidants were 2½ pounds aluminum per ton and 5 pounds calcium-manganese-silicon per ton. These physicals would still pass 4C3 specifications and with a higher draw would pass 4C2 specifications.

Test No. 2. The molybdenum content was dropped another six points below test No. 1 and the deoxidants were changed to 4 pounds of calcium-manganese-silicon plus 3 pounds ferrotitanium per ton of steel. The physical results passed the 4C3 specifications with a 1100-degree Fahr. draw. However, the carbon was slightly higher than normal and were it in the 0.28-0.32 per cent range a 1000 degree Fahr. draw would have been required. The most serious setback in this test heat was the fact that the castings were full of porosity. This hydrogen[2] porosity undoubtedly was caused by the normal moisture in the molding sand and the deoxidants used were not powerful enough to overcome it.

Test Nos. 3 and 4. The molybdenum content was dropped still further to 0.12 and 0.14 per cent, and 0.15 and 0.17 per cent chromium was added to these heats. The normal deoxidants were used—2½ pounds of aluminum and 5 pounds of calcium-manganese-silicon per ton of steel. The physical results again would have passed 4C3 specifications and also 4C2 specifications with a higher draw.

Test No. 5. The molybdenum content was dropped even further, down to 0.09 per cent with the normal deoxidants being used. The results show a 1100 degree and a 1300 degree Fahr. draw. The 1100 degree Fahr. draw would just pass the 4C2 specifications but there is little hope of ever using this alloy to pass 4C3 specifications.

Test No. 6. A boron heat was tried using 2 pounds per ton of a boron alloy containing 4 to 6 per cent boron, with the regular amount of aluminum and calcium-manganese-silicon as the deoxidants. The molybdenum content was 0.10 per cent. A chemical test indicated 0.0005 per cent boron in the castings. The physical properties of the heat treated test bar passed 4C2 and 4C3 specifications. However, a lower draw was used, 1000 degrees Fahr. draw against the regular draw of 1100 degrees Fahr. using the original molybdenum content.

A word might be said here that boron was added to the steel only after the calcium-manganese-silicon and aluminum were already in the steel. This accounts for the good recovery of boron.

Test No. 7. This analysis was one of the suggested analysis and the molybdenum, chrome, nickel with the high carbon, 0.37 per cent, make the castings susceptible to cracking upon quenching in water. However, the test bar was just normalized and drawn and was almost equal to 4C2 specification.

Test No. 8. This heat was similar to No. 7 with the exception that the carbon, 0.32 per cent, was down in the desired range. This analysis with the heat treatment passed the 4C3 specifications.

Test No. 9. The final and last heat had only 0.09 per cent molybdenum with 0.11 per cent of residual chromium. However the deoxidants were 5 pounds calcium-manganese-silicon, 3 pounds boron alloy, and 5 pounds ferrotitanium per ton of molten steel. No aluminum was used at all.

Boron and ferrotitanium are hardening agents as well as deoxidizers so it was not astounding to find out that a 1100 degree Fahr. draw was necessary to pass the 4C3 specifications although in all fairness, the 0.36 per cent carbon content should not be overlooked in regards to the high draw.

The most surprising thing, in this last of the molybdenum reduction tests, was the absolute freedom from porosity on the castings when no aluminum had been used as a deoxidant. It might also be

(*Concluded on page* 232)

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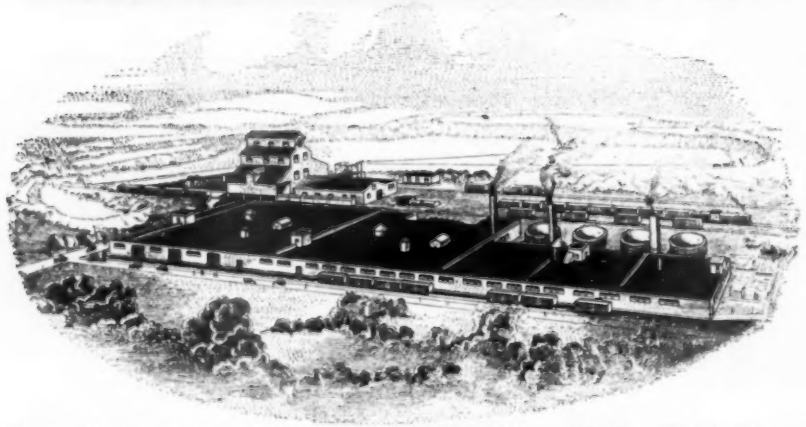

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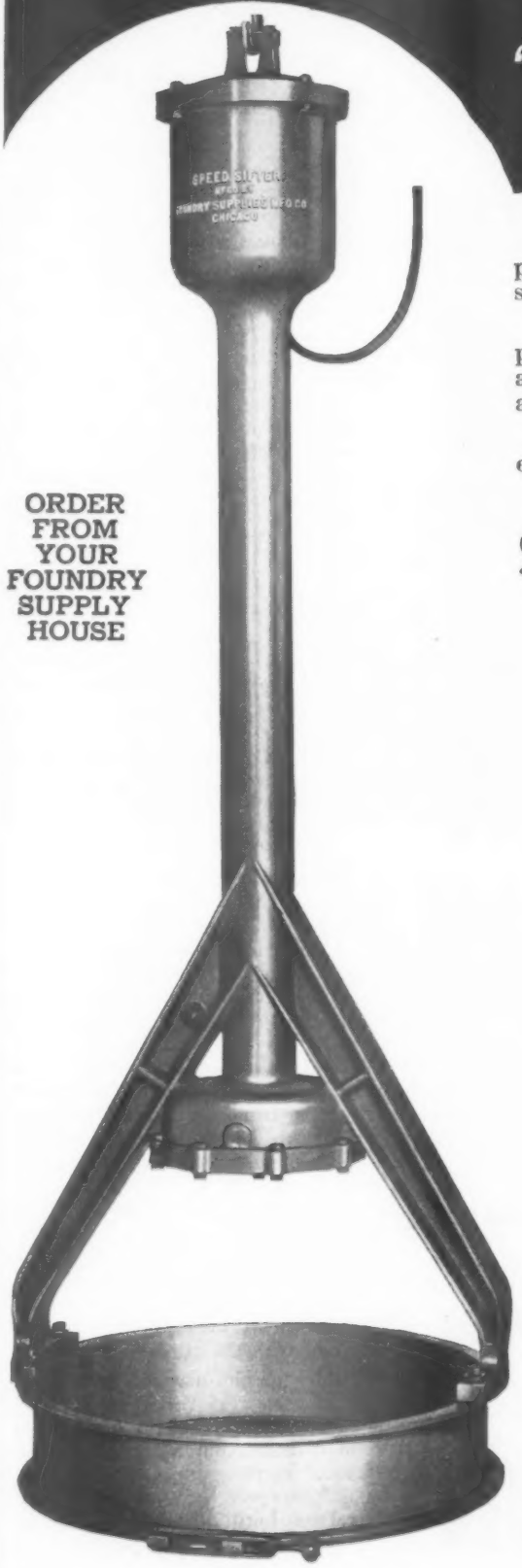

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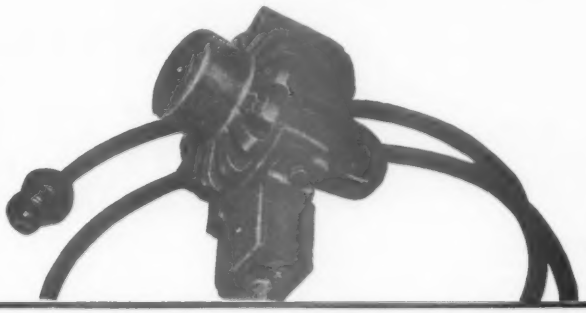

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(*Concluded from page* 230)

said here that again the boron was the last addition made to the bath of steel. The FeO in the final slag was 11 per cent.

It certainly appears that the combination of ferrotitanium and boron are powerful enough to prevent porosity and at the same time add a powerful hardening agent to the steel.

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1. "Effect of Aluminum on the Properties of Medium Carbon Steels", by C. E. Sims and F. B. Dahle, *Transactions*, American Foundrymen's Association, Vol. 46, 1938.
2. "The Mechanism of Pin Hole Formation", by C. E. Sims and C. A. Zapffe, *Transactions*, American Foundrymen's Association, Vol. 49, 1941.

INHIBITORS FOR MAGNESIUM MOLDING SAND

(*Continued from page* 83)

a characteristic of this tough black skin to bridge across the entire section, rendering any casting containing it of questionable quality.

A reduction in the blank skin formation can be effected by:

1. Flushing the mold cavity with SO_2 just before pouring.
2. Applying additional inhibitors to the runner and gate system by spraying them with sulphur-boric acid-diethylene glycol or dusting them with sulphur.
3. Careful control of the pouring temperature.
4. Skin drying the mold cavity and permitting the molds to cool down, then closing and pouring immediately.
5. Keeping the water content of the sand low.
6. Using adequate inhibitor in the sand.
7. Gating to avoid agitation and turbulence.

All of these procedures, with the exception of No. 2, come under good foundry practice, though with good inhibitors and a proper moisture content of the sand, it should not be necessary to flush the mold cavity with SO_2 except in molds having heavy sections which are poured in humid weather.

The second type of reaction or burning may, or may not, be associated with the black skin formation. This type of burning is localized, forms pits in the casting, the pits being filled with a grayish powder which can be cleaned out readily. This type of reaction quite frequently is associated with the black skin formation because the latter initiates the reaction on the melt surface which then continues next to the sand. It invariably is most pronounced in heavy sections and on the risers. This type of defect is caused by the reaction with moisture in the sand and can be avoided by the elimination of black skin formation, as outlined earlier, if it is being initiated by or associated with black skin formation. If it is not associated with black skin formation, this second type of reaction indicates that for the sections being poured the (1) inhibitors are inadequate, and/or (2) the moisture content of the sand is too high.

Inhibitors Are Inadequate

A third type of reaction or burning is revealed by the formation of a white powder to dark brown skin on all, or part, of the exterior surface of the casting, particularly on the gates and runners. The white surface readily sand blasts off, but it definitely indicates that the inhibitors are inadequate, and/or the moisture in the sand is too high. This type of reaction or burning is also associated with moisture in the sand and frequently occurs with new sand, probably because new sand does not work so well as used sand, and therefore, often requires a slightly higher moisture content. While this type of burning is caused by reaction with the moisture in the sand, it may be, and frequently is, allied with the black skin formation referred to earlier, which is mainly a reaction of magnesium with the atmosphere over it.

While magnesium may react with oxygen and nitrogen in the atmosphere, it is not only less reactive to these gases than to moisture, but as factors in the problem of burning, they are practically constant. However, moisture is not only very reactive, but it is variable in amount

(*Concluded on page* 234)

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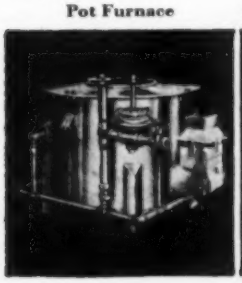

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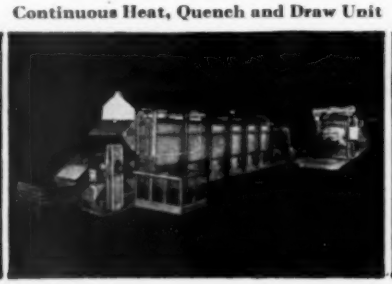
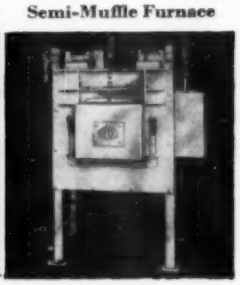
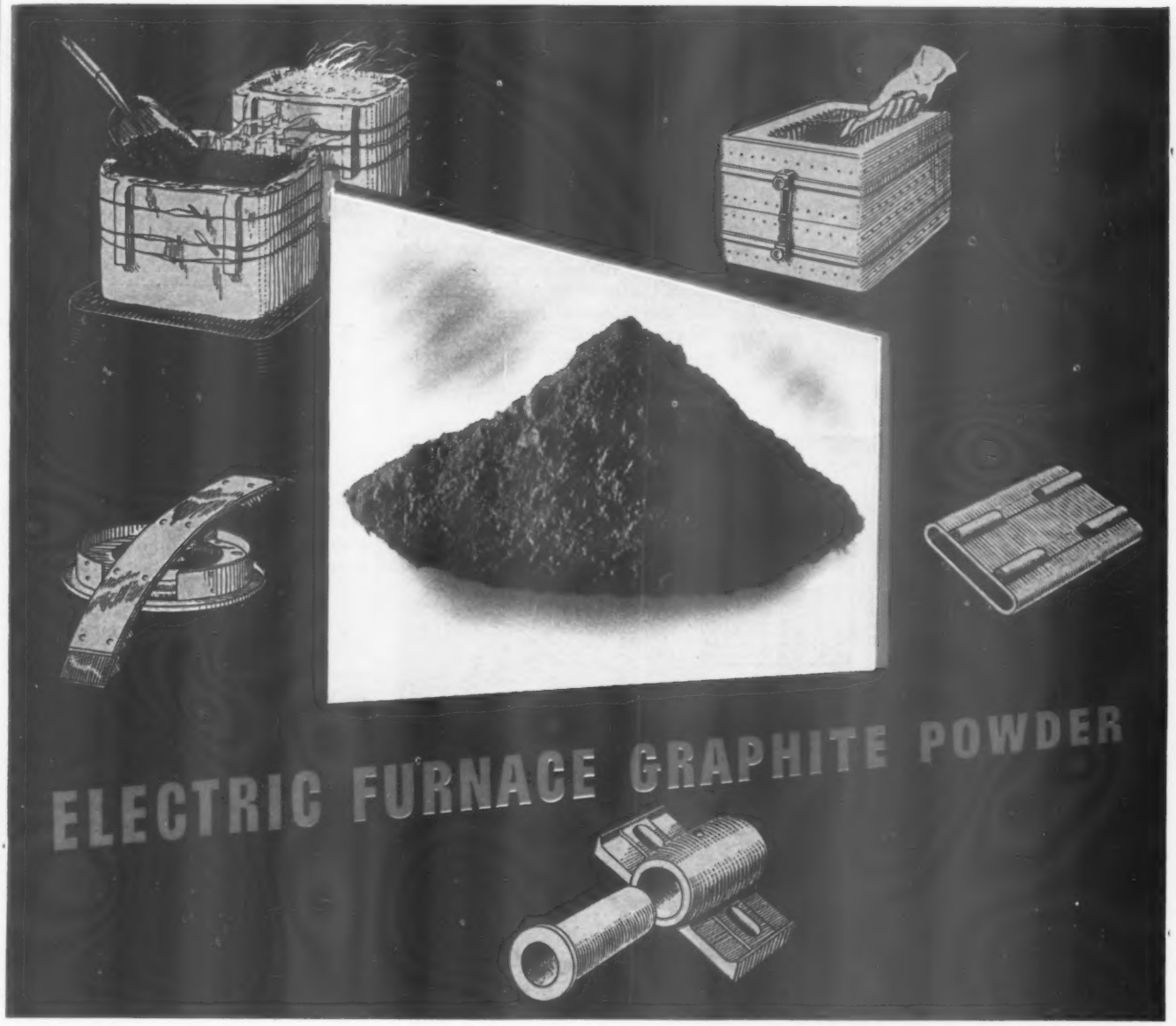


Semi-Muffle Furnace





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(*Concluded from page 232*)

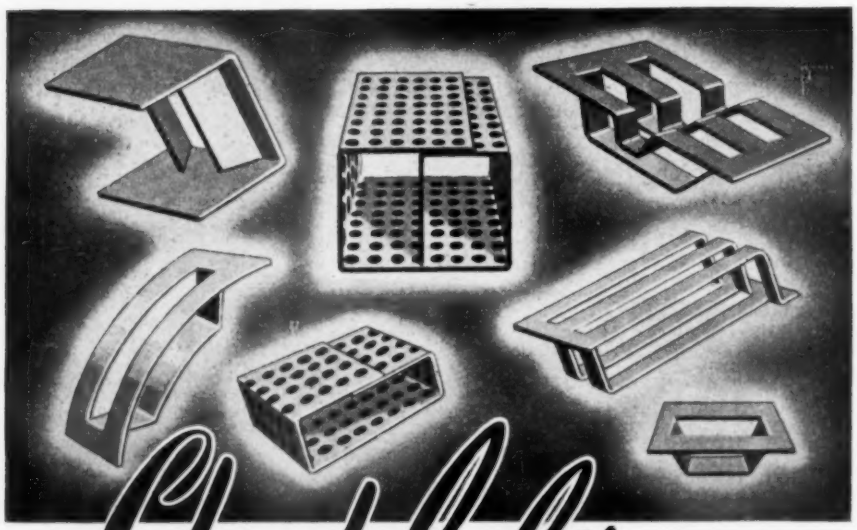
and has two places of origin, the atmosphere and the sand. As noted previously, of the three types of reaction or burning, Type 1 occurs mainly at a metal-atmosphere surface while Types 2 and 3 occur largely at metal-sand surfaces. The reduction or elimination of Type 1 reaction, as indicated earlier, is essentially a problem of proper control of the atmosphere in the mold cavity.

Unless the mold cavity is flushed with SO_2, the atmosphere in it will be more humid, all other factors the same, the higher the water content of the sand and the higher the atmospheric humidity. In addition, the mold drying procedure and length of time between closing and pouring also affect the humidity of the mold cavity. As soon as the melt enters the mold cavity, inhibitor vapor is formed to provide a protective film on the melt. Consequently, the inhibitor is a factor in the formation of black skin or Type 1 reaction, but it has relatively a minor effect.

Since the inhibitors used have a bearing on the water content of the sand, this factor is also of some importance. Unfortunately, the magnesium foundryman cannot depend on low moisture in his sand and adequate inhibitors to prevent black skin formation in excessively hot and humid weather. In such instances, other good foundry practices may be combined with a mold flush with SO_2 just before pouring.

The other two types of reaction which occur primarily on metal-sand surfaces are essentially problems of control of the moisture in the sand and of the adequacy of the inhibitors. The selection of inhibitors requires careful consideration and the various types and their effects will be considered in some detail.

(*To be concluded*)



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Electric Melters To Meet in Chicago

Robert K. Kulp, metallurgical engineer, Electro Metallurgical Sales Corp., New York, will be the principal speaker at a sectional meeting of the Electric Metal Makers Guild at the Morrison hotel, Chicago, Dec. 9. At the morning session, Mr. Kulp will discuss a "Proposed Index for Efficiency of Deoxidizing Practice in the Electric Furnace."

Other features of the program include afternoon panel discussions on acid and basic furnace practice, a luncheon and dinner. All electric furnace operators in the Chicago district are invited to attend the meeting.

Arrangements for the meeting are being handled by a committee composed of A. J. Scheid, metallurgist, Columbia Tool Steel Co., Chicago Heights, Ill., chairman; Burt J. Reynolds, melting foreman, Burnside Steel Foundry Co., Chicago; and J. H. Eisaman, assistant superintendent of electric furnaces, South Works, Carnegie-Illinois Steel Corp., Chicago.

A.S.T.M. Presented Ordnance Award

American Society for Testing Materials has received the Distinguished Service Award of the Ordnance Department "in recognition of outstanding and meritorious engineering advisory services, in war and peace, for the development, manufacture and maintenance of Ordnance materiel." The award was presented by Maj. Gen. G. M. Barnes of the Ordnance Department to P. H. Bates, National Bureau of Standards, A.S.T.M. president, at a special meeting in Philadelphia, Oct. 12.

Form New Company

Sullivan-Rayhawk, a new market research and sales promotion organization, has been formed by Dan A. Sullivan and Arthur L. Rayhawk, with headquarters in the Oliver building, Pittsburgh 22. Both men are experienced in the field. For the past 2 years Mr. Rayhawk was deputy chief of the general statistics staff, Bureau of Planning and Statistics, WPB in Washington.

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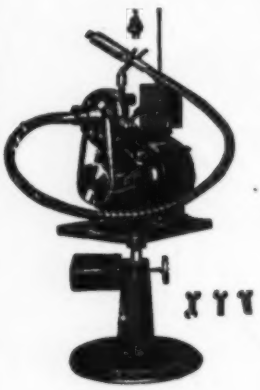

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HOW FAST DO METALS FREEZE?

(*Continued from page* 81)

not tangent to one another as they must be to represent a continuous process. If we accept (1) as correct, then the best equation for a straight line tangent thereto and representing the higher points is:

$$\frac{D}{R}=0.08721+0.7945\frac{T}{R^2} \quad \ldots(3)$$

If, on the other hand, we wish to retain (2) for the straight portion of the locus, we must substitute for (1)

$$\frac{T}{R^2}=4.56\left(\frac{D}{R}\right)^2 \quad \ldots\ldots\ldots(4)$$

The computation of standard errors of fit to decide between the two alternatives hardly seems worth while since the difference is evidently small, by inspection, probably resulting in statistically insignificant differences in this criterion.

If we select (2) for use, the transition from the curve to the straight line is at $\frac{D}{R}=0.128$, if (3) at 0.164.

A composite curve like the above is intellectually unsatisfactory, lacking an explanation of the cause for two branches. By inspection a hyperbola seems a possible single curve. By least squares the hyperbola of best fit, having its vertex at the origin, is:

$$\left(\frac{T}{R^2}\right)^2+\left(\frac{T}{R^2}\right)+\left(\frac{D}{R}\right)^2 \ldots(5)$$

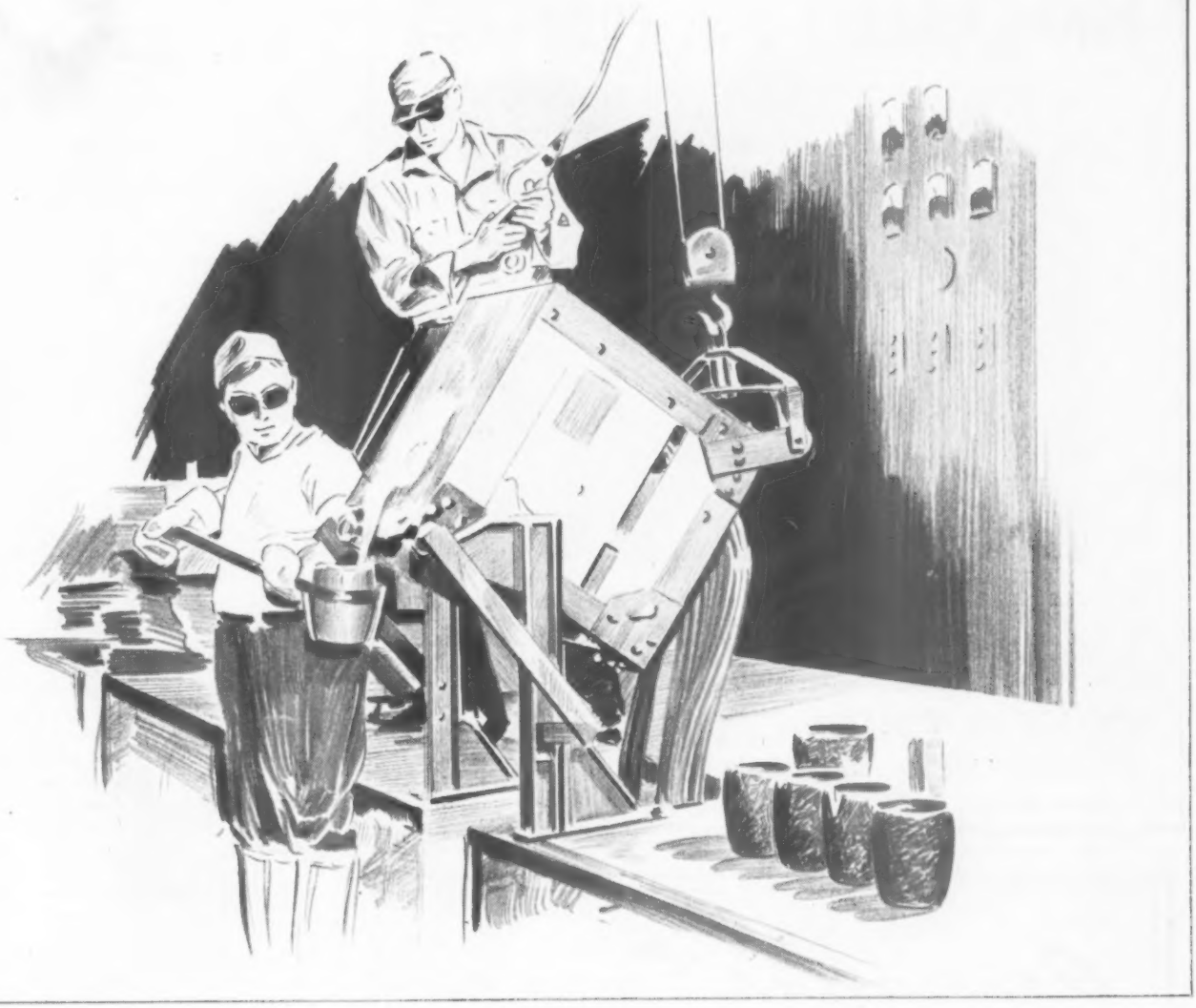
$$0.7176\left(\frac{T}{R^2}\right)^2+0.2649\left(\frac{T}{R^2}\right)=\left(\frac{D}{R}\right)^2$$

An equation such as (5) can readily be shown to give times for complete freezing $\left(\frac{D}{R}=1\right)$, which are proportional to the square of the radius and are thus qualitatively consistent with Chvorinov's rule. The constant for the numerical values of (5) is 24.75, which is in reasonable agreement with the previous approximations. The hyperbolic curve thus represents rather successfully all the recorded facts so far as they appertain to spheres. The points do not fit the hyperbola as well as the parabola and tangent.

For such equations as have been given it is not difficult to calculate the cubic inches of metal frozen per minute per square inch of surface of the casting in relation to the time which has elapsed*. The expressions are somewhat compli-

(*Continued on page* 238)

*The method of calculation is: From the original equation calculate D in terms of R and T and differentiate. Multiply $\frac{dD}{dT}$ so found by $\frac{(R-D)^3}{R^3}$, expressing D as the calculated function of R and T.



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(*Continued from page* 236)

cated but always contain R, the spheres' radius, again confirming the error in the conclusion that the freezing rate per unit area depends only on the time and not on the dimensions of the object.

The sphere is a useful shape for experimentation, for the frozen layer should be of the same thickness everywhere. This is true also near the middle of the length of a long cylinder (infinite cylinder) and near the middle of the surface of a large plate, regardless of thickness, (infinite plate and semi-infinite solid). More complicated shapes freeze relatively more rapidly at edges, corners or regions where the convex surfaces have small radii of curvatures than on large flat faces and more slowly at re-entrant angles, corners, etc. When working with prisms Briggs and Gezelius contented themselves with averages over the entire surface. Others have chosen what are in effect minimum values obtained near the middle of regions where the solidified metal was of uniform thickness.

If the radius of the sphere increases indefinitely it becomes the semi-infinite solid and it is therefore at least interesting to see what form our equations take when R becomes infinity. In that case the volume frozen per unit area per unit time becomes equal to the rate of increase of thickness. One need consider only the parabolic or the hyperbolic equations for the straight line does not begin until D has become a considerable fraction of R, which cannot happen if R is infinite.

The rate of freezing $\left(\frac{dD}{dT}\right)$ derived from (1) becomes $\frac{1}{3.8\sqrt{T}}$ when R is infinite and that derived from (4) becomes $\frac{1}{4.26\sqrt{T}}$. The thickness of layer, D in inches, deposited in time T, in minutes is then

$$D=0.52\ T^{1/2} \quad \ldots\ldots\ldots\ldots (6)$$

or $$D=0.47\ T^{1/2} \quad \ldots\ldots\ldots\ldots (7)$$

according to which equation (1) or (4) we accept. The amount of heat absorbed by a semi-infinite sand body whose surface is suddenly and permanently heated by a given amount is proportional to the square root of the time.

The relations (6) and (7) are in accord with this if the steel were poured with no superheat. The original data indicate a superheat of roughly 25 degrees Fahr. at zero time. The agreement of the numbers in these expressions with presumably known properties of dry sand will come up again later.

For the hyperbolic curve the rate of freezing $\frac{dD}{dT}$ is 0.51 and independent of time. That is, the amount frozen, in inches, in T minutes is:

$$D=0.51\ T \quad \ldots\ldots\ldots\ldots (8)$$

Unless one is to regard the hyperbola as a satisfactory empirical approxima-

(*Continued on page* 240)

WEIGH THE RESULTS!

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(*Continued from page* 238)

tion, applicable only below some limiting value of R, a set of physical assumptions must be found making (8) as plausible as (7) was, at least in form.

Briggs and Gezelius also experimented with prisms whose surface volumes were equal to that of a 6-inch sphere. With certain corrections for the assumed effect of gates, their surface areas were 1.35, 1.60 and 2.10 times that of the sphere; hence according to Chvorinov their freezing times should have been 0.55, 0.39 and 0.23 times the freezing time of the sphere. No freezing times were recorded, but extrapolating the published data for a skin thickness one-half the minimum dimension of the prism (or sphere) these ratios came out 0.52, 0.30 and 0.136 respectively. The thinner the section the more rapidly did the castings freeze compared with Chvorinov's expectations, if this extrapolation is reliable. Actually the average thickness of the metal was greater, by an unknown amount, than the minimum thickness, and the extrapolated freezing times are all somewhat too short.

Briggs and Gezelius' observations are supported qualitatively, but not quantitatively, by observations by Troy at the Dodge Steel Co., ("Controlled Solidification by Gradient Heat Extraction"—*Steel Foundry Facts*, Steel Founders' Society of America, February, 1943—p. 2). He measured the rate of skin formation at the faces of a 5 x 5 x 8-inch ingot cast in green sand. This prism has a volume of 200 cubic inches and according to Briggs and Gezelius should have formed a skin at the same rate as a sphere of equal volume whose radius would have been 3.6 inches +. If the locus for such a sphere be computed and compared with the curve recorded by Troy in *Steel Foundry Facts*, the latter curve is found to represent uniformly about twice the freezing times predicted by the former.

Observations Are Verified

Troy's observations were quite well verified by Yearley in unpublished data obtained at the Chicago Works of the National Malleable & Steel Castings Co. The former compared green and dry sand, finding the results interchangeable. That series of tests is represented by points in Fig. 3 and falls somewhat closer to the Navy curve than does his general curve for which the author has not found the individual observations. Also, Troy recorded actual thicknesses, and Briggs and Gezelius average thickness known to be greater than those at the middle of a flat surface. This would account for a difference of unknown magnitude, but in the right direction. Extrapolation for time of complete freezing evidently would not give results under Chvorinov's principle consistent with the prediction for the sphere since the area of the prism is larger for equal volumes.

Estimates of the amount of metal freezing under different circumstances can be made based on well established

(*Continued on page* 242)

another
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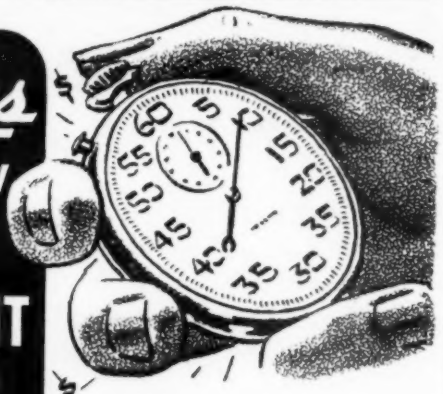

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(*Continued from page* 240)

theories of heat conduction. The results depend upon the assumptions made as to conditions applying which are generally rather arbitrary. Assuming that the sand mold was not perceptibly heated on its exterior surface during the three minutes or so over which Troy's records extend, it may be treated as a semi-infinite solid in which case the heat absorbed would be:

$$\frac{2\theta_0}{h\sqrt{\pi}}\,T^{1/2}$$

In centimeter-gram-second units for sand $K=0.0037$, $h^2=0.0049$. Assuming a surface temperature of 1450 degrees Cent. $=\theta_0$, after Chvorinov, and that a layer of metal 1 inch thick gave up 1688 calories per square centimeter when freezing, all of which was transmitted to the sand, the thickness of the frozen layer calculated from these data, any of which could be criticized, agrees surprisingly well with Troy's observations.

Briggs and Gezelius gave data correlating time, temperature and distance from the mold surface in the molding sand which, using the foregoing data, account reasonably well for the freezing rate in relation to the heat absorbed by the sand. Since temperatures are measured, no use is made of the numerical value of the thermal conductivity (k). The observations indicate a faster penetration of heat in their experiments than would correspond to $K=0.0037$, whereas Troy's experiments, and Yearley's fit that value. One is tempted to account for the otherwise inexplicable and serious difference by assuming a difference in conductivity for the sands used by several observers. Resistance to heat transfer across a surface of contact cannot be the explanation because the *slower* heat transfer was calculated assuming no such resistance. It seems a complicated explanation to assume that Troy's k was actually equal to Briggs and Gezelius' but that he and Yearley encountered surface resistance and the others did not.

Report Contradictory Observations

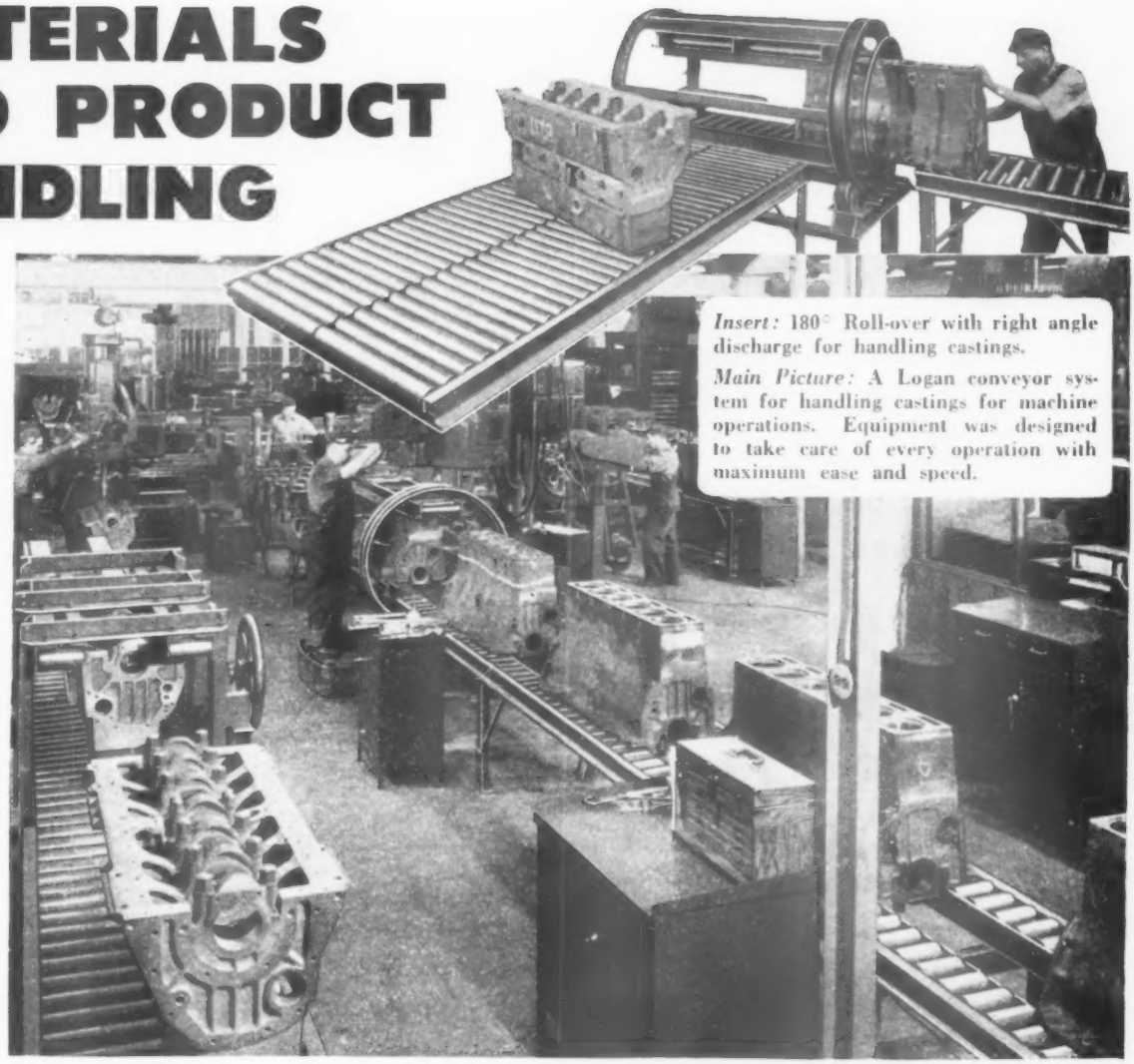
So far as concerns the freezing of cast steel in green or dry sand molds, but *not* for cast iron where contradictory observations have been reported, one may say that:

In the early stages when the solidified layer is but a small part of the total metal, the thickness of skin increases with the square root of the time. Thereafter freezing is accelerated, less time being required to freeze a given layer than would be required by a quadratic relation. It cannot be said whether the relation for long continued solidification is better expressed by an hyperbola or a parabola and a straight line tangent; either fits the observations.

The parabolic relation is that to be expected if semi-infinite masses of steel and sand were brought in contact and the surface of contact remained at constant temperature. The condition would require relatively high heat conductivity in the metal compared with sand and

(*Concluded on page* 244)

MATERIALS AND PRODUCT HANDLING



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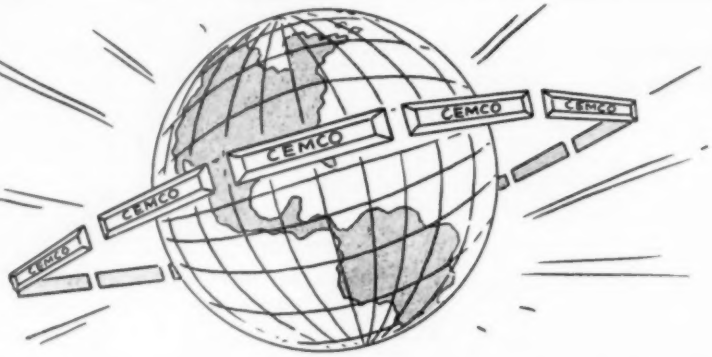

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that most of the iron's heat loss was latent heat. Both these limitations are closely approximated in fact.

The rate of freezing observed by different experimenters differ to an extent probably explicable only on the basis of great differences in sand conductivity for heat. It may be that these differences and the accelerated freezing rate as time goes on could be accounted for by the contribution made by radiation and convection to the apparent thermal conductivity.

It can be shown that if radiation from sand grain to sand grain in successive layers in the mold is effective in heat transfer the apparent conductivity K_a will be related to the true conductivity K of the sand by an expression such as

$$K_a = K + m\,T^3$$

where m is a function of grain size and form and the packing of the sand. T is the *absolute* temperature. The introduction of such a variable value of K into the expression for diffusivity $h^2 = \frac{K}{pc}$ and thence into heat transfer equations will cause considerable mathematical complications.

Simplifies Reading Shop Drawings

"A New Approach To Axonometric Projection and Its Application to Shop Drawings" is the title of Bulletin 79, the latest issued by the Texas Engineering Experiment Station, Agricultural and Mechanical College of Texas, College Station, Tex. This 31-page publication, presents a new method and approach to the subject developed and used by the author, J. G. McGuire, associate professor of engineering drawing, for a class of trainees for North American Aviation Inc. In addition to explaining the theory of this system, the study shows the advantages of using the axonometric projection as an additional view on the shop drawing. This additional view should speed up the reading of blue prints and eliminate many faulty interpretations, particularly with the large number of comparatively untrained and inexperienced shop men at present in industrial establishments.

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With a record of over 2000 trainee placements, the Doall Trade School, organized in July, 1941, has moved from Minneapolis to new and larger quarters in Des Plaines, Ill. The Doall Co., sponsor of the school, has cut the course to a 4-week training period with 74 per cent of the time spent in practical shop work. Special stress is placed on the use of machine attachments and design of special production fixtures, the trainees also receiving valuable first-hand test data and setup experience.

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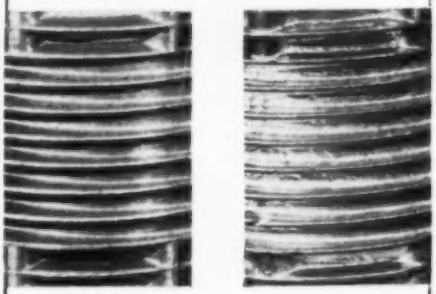

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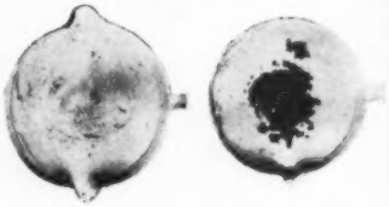

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VANADIUM IN GRAY IRON CASTINGS

(*Continued from page* 89)

(under 1300 degrees Fahr.) occurs more slowly, or not at all, in vanadium-containing gray cast iron. This fact at least partially explains the superior performance of such irons under conditions of elevated temperatures. It is of distinct importance in gray irons for use in internal combustion engines, brake drums and similar applications as well as in cast irons exposed to either occasional or continuous exposure to heat.

At temperatures above the transformation (approximately 1325 degrees Fahr.) the effect of vanadium also is marked. Table I, shows the properties of a series of gray cast irons as cast and after 150 cycles of heating to 1500 degrees Fahr. followed by cooling until black (until red at the end of each ten cycles). Improved retention of strength after prolonged heating is observed in all of the vanadium irons. This high temperature stability is reflected also in improved strength while at these temperatures, as indicated by the satisfactory service of these irons in high temperature applications. The combinations shown in Table I are not the only ones exhibiting these characteristics. In fact, more recent service data would indicate that the molybdenum-vanadium and chromium-vanadium combinations may be even more satisfactory than the ones indicated in Table I.

Effect on Chill Varies

Since the effect of vanadium in gray cast iron is to stabilize carbide, it would apparently follow that it also increases chill depth and hardness. However, this is not necessarily the case. For example, in percentages up to 0.10 to 0.12 per cent, the chill depth remains constant or may actually be reduced. In the higher percentages, the chill depth is increased unless compensated for by a powerful graphitizing inoculant or an element such as nickel or copper. Normally, the castings in which vanadium is used in percentages over 0.12 per cent contain sections sufficiently large that the minor increase in chilling tendency which occurs is not of sufficient importance to require compensation.

The addition of vanadium to gray cast iron effects an increase in tensile and transverse strengths, and brinell hardness. The percentage increase is dependent upon (1) the amount added, (2) composition of the base iron, and, (3) the controlling cooling rate of the casting.

In most cases in which vanadium is the only alloying element employed, the increase in tensile strength *alone* is not sufficient to warrant its use. This is particularly true since an equal increase in tensile strength can be obtained more economically by other means. However, when resistance to structural decomposition at elevated temperatures, or uniformity of hardness and strength throughout a heavy section is the characteristic of importance, vanadium may be and is used to advantage as the sole alloying element. An example of the latter application is found in automotive body dies. Otherwise, however, it is used in combination with one or more other alloying elements.

When used in conjunction with elements such as chromium, molybdenum, copper and nickel, the effect becomes sufficiently marked to make it a very economical and practical alloying element in gray cast iron. Vanadium is outstanding in its ability to accentuate the effectiveness of other alloying elements when combined in proper proportions. This factor alone would account for its use in high strength applications even if other properties such as wear or shock resistance were not of importance. Because of this factor of improving the physical properties of already alloyed cast iron, it is unusually advantageous in applications in which maximum mechanical properties are desired as well as in applications requiring high mechanical properties at lowest cost.

Rely on Service Data

Although its influence on the more commonly considered physical and mechanical properties of alloyed gray cast iron is sufficient explanation for its use, actually the greatest advantage of vanadium lies in its effect on a property such as wear resistance. However, methods of testing this property of gray cast iron are far from perfect so that it is necessary in most cases to rely on service data rather than laboratory data for most of our conclusions. Although this fact has delayed the development of these irons somewhat, it has served to give us the ultimate answer to most problems; namely, what is accomplished in service.

One of the valuable contributions of vanadium is to increase uniformity of structure with the consequent increase in the reproducibility of mechanical properties. This effect is illustrated in Fig. 3. Obviously if a large spread in mechanical properties exists within a group of irons of the same chemical composition, only the minimum properties may be utilized by the engineer. Therefore, any improvement in reproducibility of results effectively increases the working capacity of the material. For example, in Fig. 3, the increase in the maximum tensile strength of gray cast iron (in a 1.2-inch diameter bar) attributed to the addition of 0.15 per cent vanadium is 5000 pounds per square inch. However, the increase in the minimum tensile strength observed is 12,000 pounds per square inch. Therefore, in this case, the effective useful tensile strength, with which the designer can work, has been increased by 12,000 pounds per square inch. This factor is of major importance in the production of gray cast iron to an engineer's specifications.

One of the most interesting combina-

(*Continued on page* 248)

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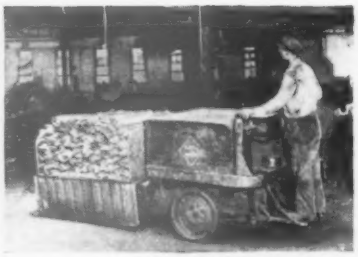

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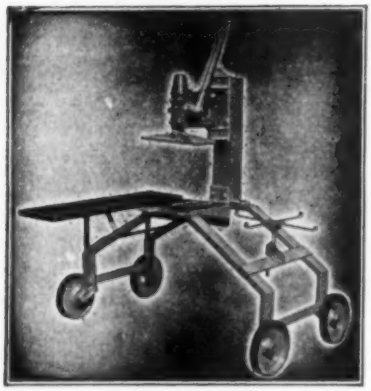

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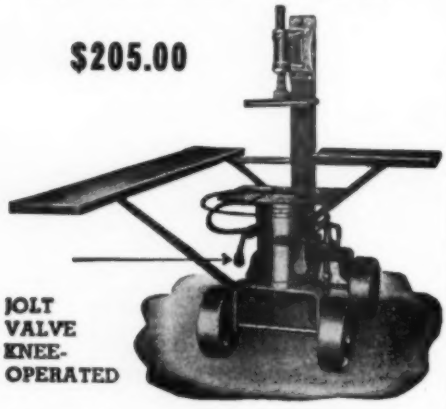

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(*Continued from page* 246)

tions of alloying elements is that of molybdenum and vanadium. In correct proportions this combination of elements imparts high tensile strength, maximum impact resistance, and relatively low brinell hardness with a corresponding optimum machineability. This combination is particularly effective in irons of over 50,000 pounds per square inch tensile strength although it is also economical in irons as low as 35,000 pounds per square inch tensile strength under certain conditions. A typical analysis of an iron of this type is shown in Table II.

TABLE II—High Strength Cast Iron

Analysis

	Per Cent
Total Carbon	3.00
Manganese	0.58
Silicon	2.08
Molybdenum	0.65
Chromium	0.08
Vanadium	0.10
Nickel	1.00

Properties

Hardness	248
Transverse (18" center) lb.	3740
Deflection (18" center) in.	0.338
Tensile, lb. sq. in.	59,400
Charpy impact (1.125" x 6") ft. lb.	66

These data were obtained from commercial electric furnace cast irons. Similar results are being obtained from cupola cast iron of suitable composition. Higher percentages of vanadium in this combination further increase tensile strength, but with a corresponding increase in brinell hardness. Service tests on the above iron led to its adoption in a high strength application in which wear resistance was of prime importance.

Although vanadium does not improve the machineability of unalloyed pearlitic gray cast iron, it may improve machineability of high strength alloyed cast iron. This is probably due to its tendency to promote sorbite or fine pearlitic rather than martensite or pseudo-martensite. High tensile strength gray cast irons are necessarily less machineable than soft irons of low strength. However, vanadium minimizes the loss in machineability by promoting strength and toughness with minimum brinell hardness. When tensile strength is divided by the brinell hardness value, a ratio is obtained which may vary from 150 to 300. The higher this ratio, the more machineable the material is for any given tensile strength. In fact, this ratio is frequently used as a general *rule of thumb* indication of metal quality and general utility. The effect of vanadium, particularly in combination with molybdenum, is to increase the ratio.

It is rather unusual in gray iron metallurgy to combine two or more carbide-stabilizers. The usual combination is a graphitizing element with a stabilizing alloying element. However, recent work has indicated that combinations of vanadium with molybdenum and/or chromium are extremely effective for high tensile strength applications. If wear resistance becomes a major factor, these combinations are even more effective. It rapidly is becoming apparent that it is uneconomical, and therefore, poor metallurgical practice to attempt any major increase in mechanical properties with one alloying element alone. By working with smaller amounts of a number of elements having the same general effects, the same increase in tensile strength (and other properties) may be obtained more economically and usually with better machineability. Therefore, although some references might indicate that an increase in tensile strength of, for example, 10,000 pounds per square inch may be obtained by the use of molybdenum, chromium, nickel or vanadium used independently, the use of combinations of these elements is frequently much more desirable from the standpoint of both cost and service. More and more thought and study is being devoted to this subject so that it is now possible to predict that alloyed gray cast irons of the future will be largely combinations of relatively small amounts of a number of elements rather than a large amount of any one. It is also safe to predict that these alloyed gray cast irons will be inoculated in the ladle to insure optimum effectiveness of the alloying elements being used. Greater economy and a subsequent greater field will be developed for this type material.

Although the major tonnage of vanadium cast irons is in the field of room temperature applications, the more unique and interesting applications are dependent upon its effect on the properties at elevated temperatures. Elevated temperatures may be produced either by heat generation due to friction and wear such as in a brake drum, or by directly applied heat as in the case of hot working dies or externally fired pots. Vanadium is effective under both conditions.

Reduces Checks and Cracks

Its use in wear resistant applications is frequently for the purpose of overcoming or reducing the tendency toward heat checks and cracks which are caused by rapid heating and cooling due to intermittent frictional use. In many of these applications, ultimate failure is due to the heat checks or cracks rather than to the actual metal loss due to wear. If this is the case, the wear resistance of the metal is a direct function of the elevated temperature stability.

During the past few years vanadium has found increased use in wear resistant applications in which the conditions are too severe for ordinary alloyed or unalloyed gray cast irons. Very few laboratory data on wear resistance of this type are available; in each case actual service results have been the only basis for the adoption. Although considerable work remains to be done on these newly developed applications, important advances have been made. The vanadium-bearing irons for this purpose have been divided into two distinct groups (1) low or medium carbon irons, and, (2) high carbon irons.

The low or medium carbon base irons have been used successfully in applications which require tensile properties of 50,000 pounds per square inch or more, in order to meet engineering specifica-

(*Continued on page* 250)

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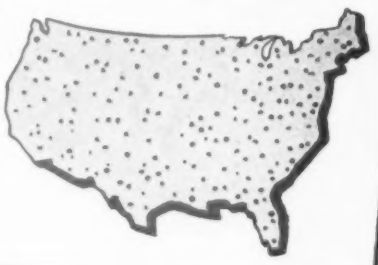

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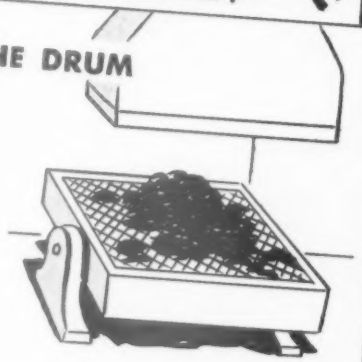

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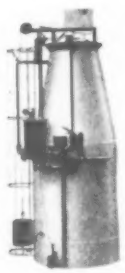

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(*Continued from page* 248)

tions. This type of iron is employed in gears, clutch drums, transmission assemblies and light and medium weight brake drums. A typical analysis of this class of iron, together with its physical properties, is shown in Table II. Nickel-molybdenum-vanadium-cast irons of this type have shown service records of from 50 to 300 per cent longer life than competitive materials. In one recent service test on bus brake drums under severe conditions, a set of medium carbon nickel-molybdenum-vanadium cast iron drums performed successfully for 276,000 miles as compared to 100,000 miles for previously used materials.

There is a growing interest in the use of high carbon base irons utilizing vanadium and other alloying elements. The high carbon types are being developed for those applications which require exceptional wear resistance and resistance to heat checking, and in which the metal sections involved permit the use of material having a tensile strength from 35,000 to 45,000 pounds per square inch. Gray cast irons of this type have been made with a total carbon content of over 4 per cent, but the present tendency is toward total carbon contents on the order of 3.70 to 3.90 per cent.

Irons of the high carbon type are being used successfully in applications such as heavy duty brake drums, clutch drums, and even in hot forming dies handling materials heated to 2200 degrees Fahr. The resistance to heat checking is usually the ultimate consideration in these applications, and determines the service life. In one hot forming application recently observed, previous die materials required re-dressing in less than 1000 cycles of operation. The first high carbon molybdenum-vanadium cast iron die was removed in good condition after 3500 cycles, and did not require redressing at that time.

A typical analysis of the high carbon molybdenum-vanadium iron being used for this type of application is as follows:

	Per Cent
Total carbon	3.70-3.90
Silicon	0.80-1.40
Molybdenum	0.75-1.25
Vanadium	0.20-0.30

Chromium may be added to this metal if the sections involved in the casting require additional hardness.

The reason for the success of this type iron in severe wear and heat resisting applications has not been proved definitely on a laboratory basis, but the metallurgy involved does follow rather logically from previous knowledge of the effects of vanadium and other elements in gray cast iron. The highest possible carbon compatible with the required tensile and transverse properties is utilized. This follows the theory that free graphite in cast iron increases resistance to heat shock. This presupposes that heat shock is an inherent factor in wear resistance under the conditions involved. Service data supports this contention. Vanadium not only stabilizes the structure, but refines the graphite and prevents open iron thus giving assurance of good wearing life. Of equal importance is the fact that vanadium does not reduce toughness and resistance to heat shock in these applications. Molybdenum is added to contribute strength and density both in the as cast condition, and at elevated temperatures. Molybdenum also increases the inherent wear resistance and density of the matrix as well as contributing to refinement of the graphite. The resulting metal contains a large percentage of finely divided free graphite imbedded in a tough, stable, wear-resistant matrix.

As previously indicated, vanadium increases the stability of gray cast iron structures at temperatures above the critical range. The fact that these irons maintain maximum physical properties after annealing or normalizing is frequently the determining factor in their use. This was forcefully brought out during the recent investigation by Crosby and Timmons, (THE FOUNDRY, November, 1941). During this investigation it was shown that the molybdenum-vanadium cast iron in their experiments showed the highest tensile strength of all the irons tested after annealing to a specified brinell hardness of 207 even though it did not have highest tensile strength in the "as cast" condition. This vital factor has tremendous commercial possibility in engineered gray cast irons which are made and heat treated to a specified brinell hardness.

Has Many Uses

The use of vanadium to assist in the maintenance of maximum properties in heat treated gray cast irons is not confined to annealing and stress relieving. Combinations of molybdenum, vanadium, nickel and chromium, also are beginning to find a commercial use in quenched and tempered gray iron castings in which maximum toughness and tensile strength in the brinell hardness range of from 400 to 500 is desirable. The actual tonnage of this type of iron is still small, but for castings of suitable size and shape, unusual wear resistance properties can be developed by the heat treatment of complex vanadium alloyed gray iron castings. The use of vanadium in heat treated steels indicates some of the possibilities that exist for such a material.

Applications of particular interest are those in which resistance to wear, resistance to deformation, resistance to heat checking, resistance to growth and warpage at elevated temperatures, and maximum density and toughness combined with high tensile strength, are of ultimate importance. Both high carbon and low carbon base irons respond to the addition of vanadium, and both are used in most of the applications. The property which determines the carbon content of vanadium irons is usually the tensile strength since many of the applications which might be better met with high carbon irons are forced to a lower carbon content in order to meet the tensile strength specification. However, vanadium is of great importance in per-

(*Concluded on page* 252)

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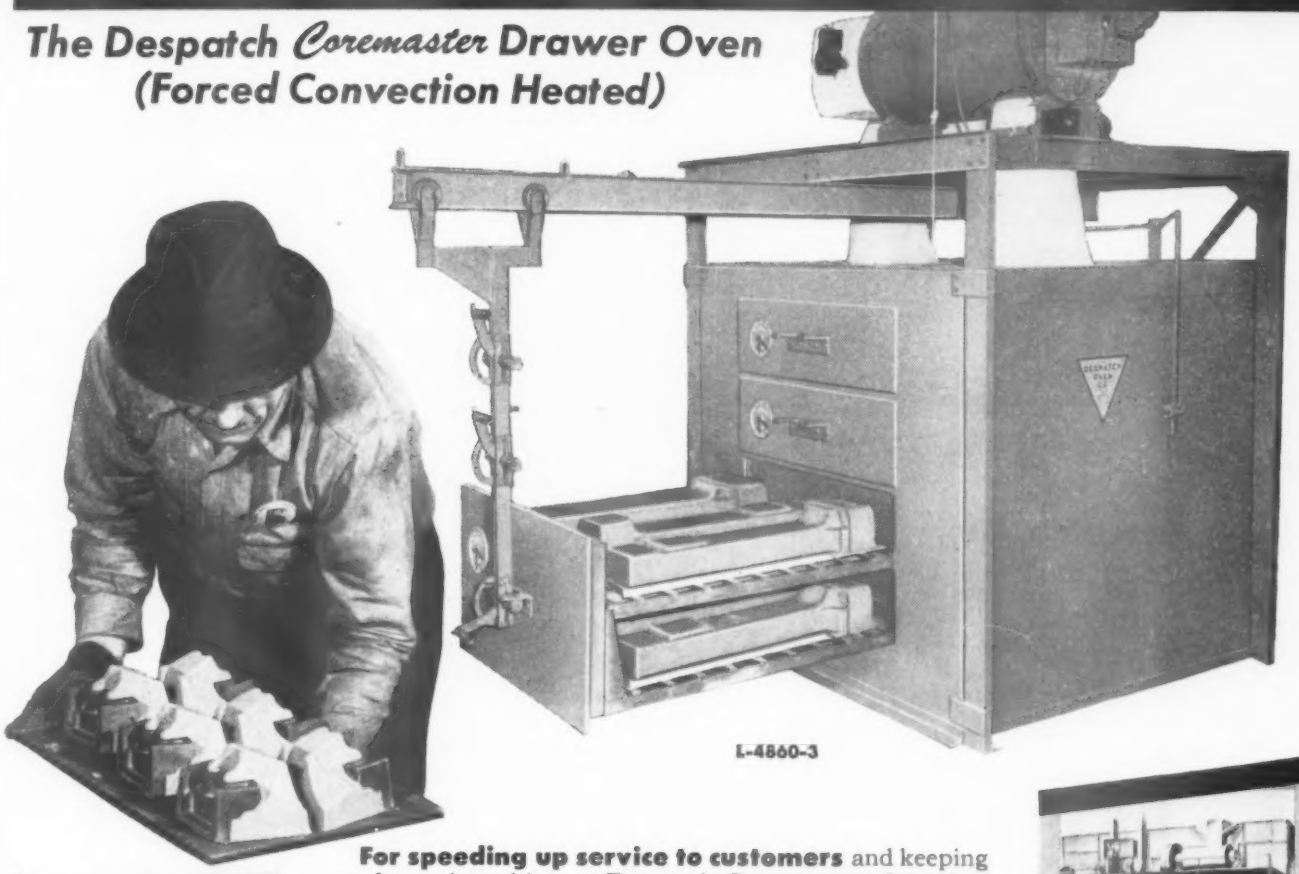

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(*Concluded from page 250*)

mitting the highest possible carbon content in heat and wear resistant applications together with maximum tensile strength and without excessive coarsening of the graphite flakes.

With the possible exception of cold forming dies in which vanadium is used to maintain maximum density at the center of heavy sections, it is used almost exclusively in combination with other alloys, particularly molybdenum, nickel and chromium.

In applications in which heat treatment is utilized for the purpose of obtaining maximum machineability, vanadium, particularly in combination with molybdenum, nickel and/or chromium, acts to maintain maximum tensile strength at a given brinell hardness. In applications in which a high brinell hardness is obtained through quenching and tempering treatment, vanadium is extremely effective in promoting maximum toughness and tensile strength.

Probably the most important and interesting application of vanadium cast irons at the present time is in those castings subjected to wear under conditions in which the friction applied creates appreciable heat. In applications of this nature such as heavy duty brake drums, its use in proper combination with other elements has been responsible for service life far beyond that normally anticipated in competitive materials. The same effect of vanadium is utilized in wear resistant applications in which elevated temperatures are reached because of externally applied heat. The most important of these applications up to the present time has been the use of vanadium in combination with molybdenum and chromium in hot forming dies, handling materials heated to temperatures up to 2200 degrees Fahr. In these applications the amount used is from 0.20 to 0.30 per cent.

Alloyed in Small Amounts

Although the role of vanadium in gray cast iron is primarily in special engineering applications, it shows promise of being widely adaptable in ordinary high strength applications and even in medium strength applications in which the combination of many different alloying elements in small amounts are used. The acceptance of this type of what we might call "low alloyed gray cast iron" is increasing and is expected to increase even more rapidly in the future. It is demonstrated readily that specified physical properties, together with maximum versatility, can be obtained most economically by the combination of small amounts of three or four different alloying elements rather than by the use of a large amount of any one or even two alloying elements. This factor will have tremendous influence on the future of the alloy cast iron production since it will permit the more widely accepted use of alloyed irons produced at a more reasonable cost. These low alloy irons will not particularly compete with highly alloyed irons for special purposes such as the high molybdenum-vanadium, high carbon irons used for hot forming dies, but it will compete with unalloyed gray iron castings for normal applications in the Class 30, Class 40, Class 50, and possibly Class 60, ASTM specifications. The use of from 0.08 to 0.15 per cent vanadium is unusually effective and economical in these complex "low alloy cast irons".

Savings Effected by Welding Repairs

Welding is saving thousands of tons of metal through the reclamation of defective castings, and this use has become one of the most important salvage projects of modern times, according to a survey made by the Lincoln Electric Co., Cleveland.

Three cases showed savings of $10,000 to $15,000 per month by weld repairing cast valves. A fourth company reported that it is reclaiming approximately 2000 pounds of castings a week. The valves, for use in the petroleum industry, are of cast and stainless steel and range in size from 2 to 20 inches and in weight from 50 to 2000 pounds.

In correcting leaks, found in about 25 per cent of the valves, the defective portions are first chipped out, then welded with 5/32-inch and 3/16-inch electrode, the weld metal being specially adaptable for welding 18-8 stainless steels. From 5 to 20 passes are made depending upon the depth of the area to be built up.

Distortion of the valve metal was avoided by annealing the valve bodies to 1100 degrees Fahr., then reducing the heat to 200 degrees at the rate of 50 degrees per hour. Amperage used for the 5/32-inch rod was 125 to 160 with 150 to 175 amperes being used for the 3/16-inch rod sizes. Valves are positioned in a turntable jig to effect the most efficient welding speed and uniform deposit of weld metal.

Another instance of notable savings through weld-reclamation involved the repair of cast cylinders and water jackets for air compressors. These castings, of gray iron, range in weight from 3 to 300 pounds with sizes varying from 3 inches in diameter by 6 inches long to 24 inches in diameter and 36 inches long.

Previously, about 2000 pounds of the cast cylinders and water jackets per week were rejected and scrapped. Now, defects due to faulty casting methods or errors in machining are ground out. All castings are welded without preheating but each weld is peened with a hammer to eliminate slag inclusions.

General purpose electrodes for cast iron are used in ⅛-inch and 5/32-inch sizes. Although the weld metal is generally stronger than the cast iron, it is machinable and presents a dense, leakproof repair. The area to be built up with weld metal sometimes measures up to 1 inch in depth, requiring a number of overlaying beads. No jigs or fixtures are used for this type casting repair.

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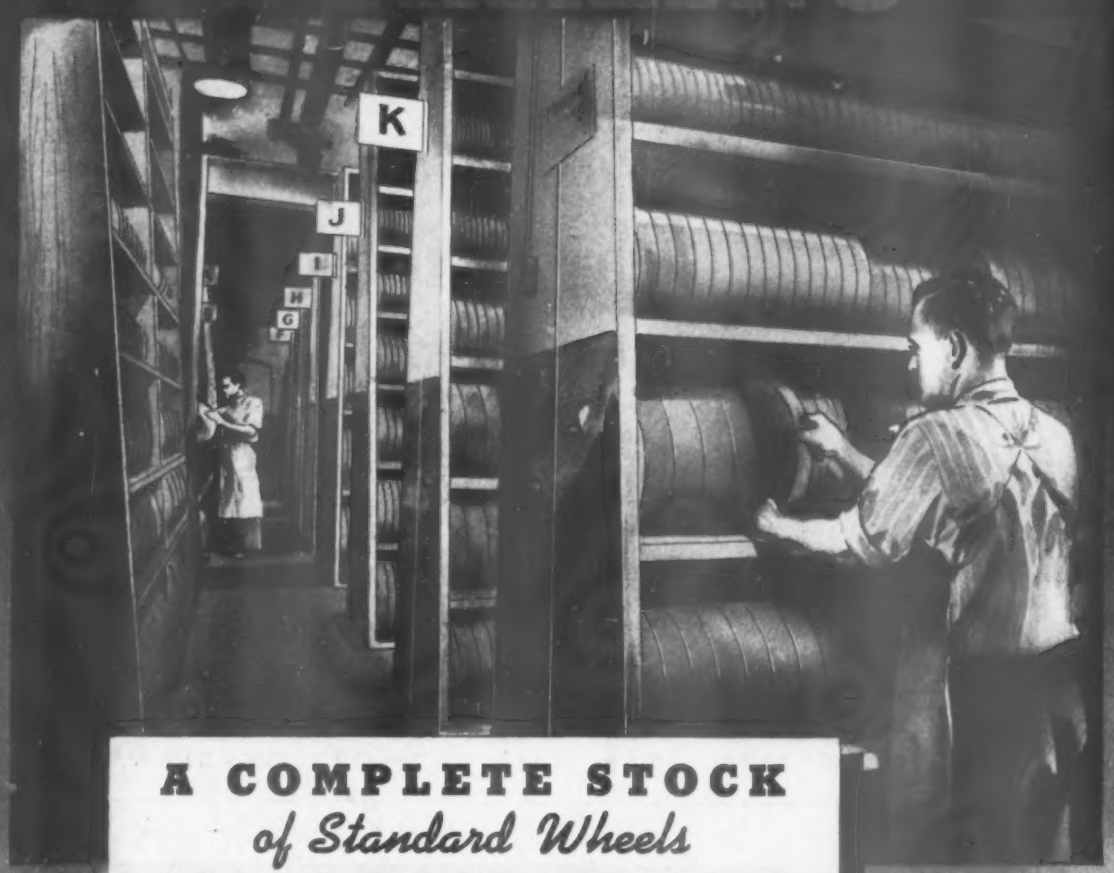

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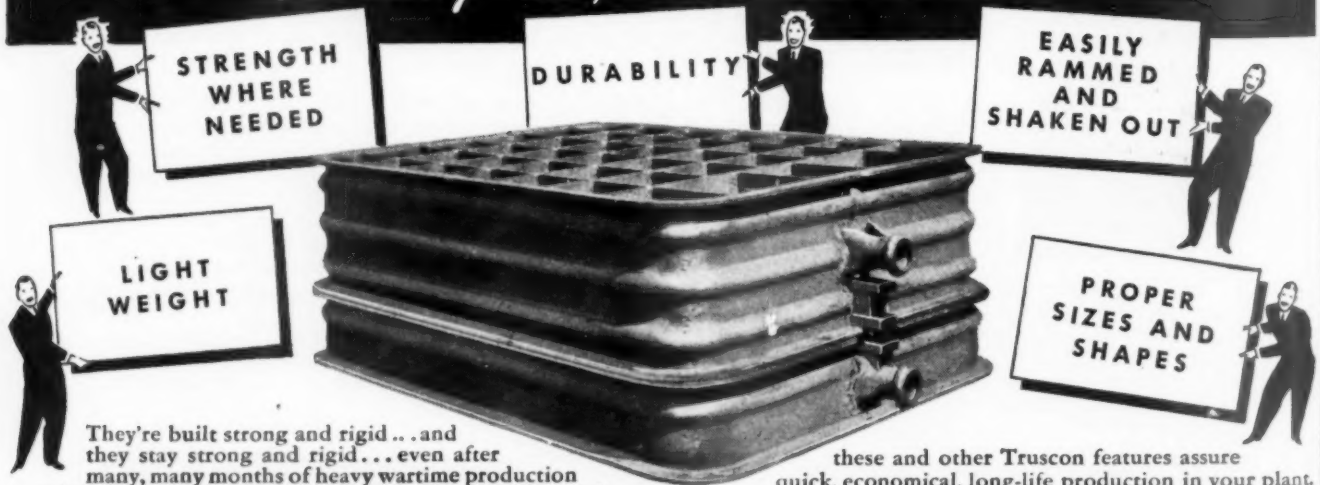

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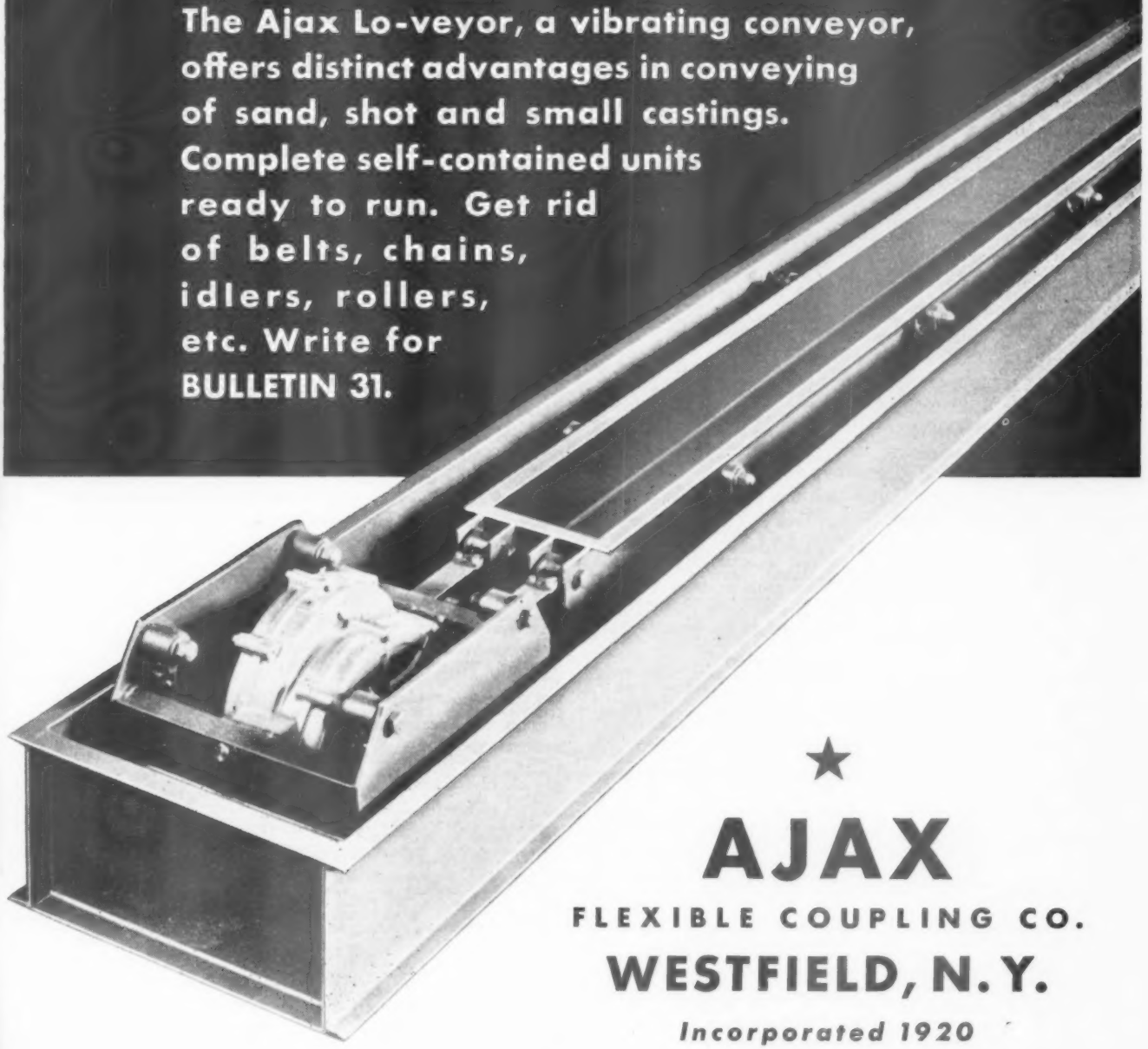

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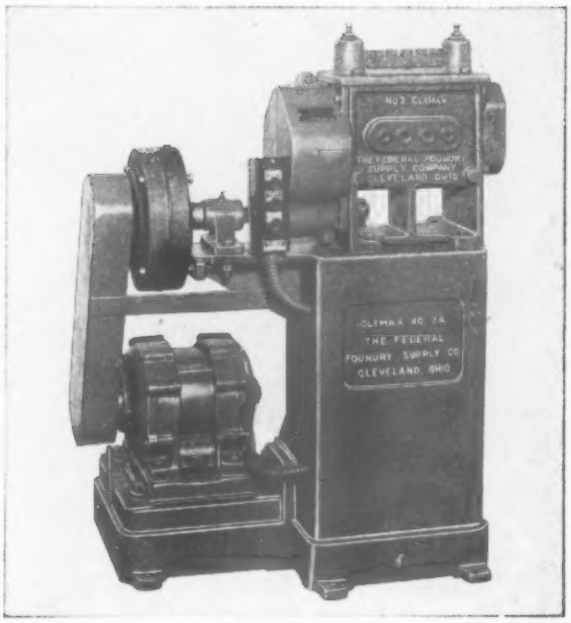

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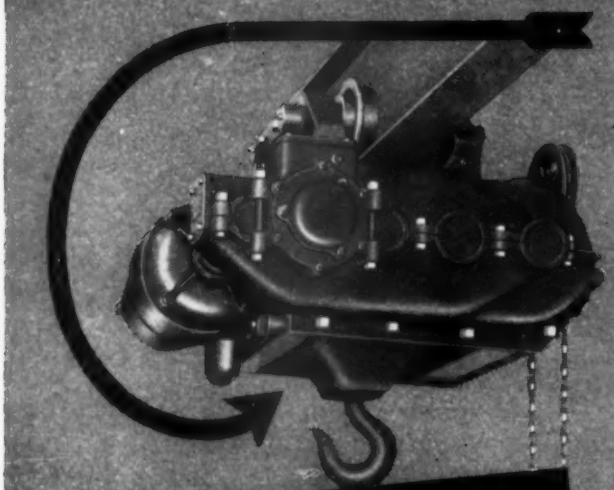

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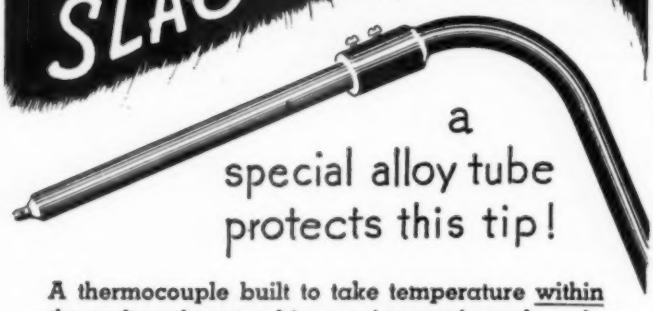

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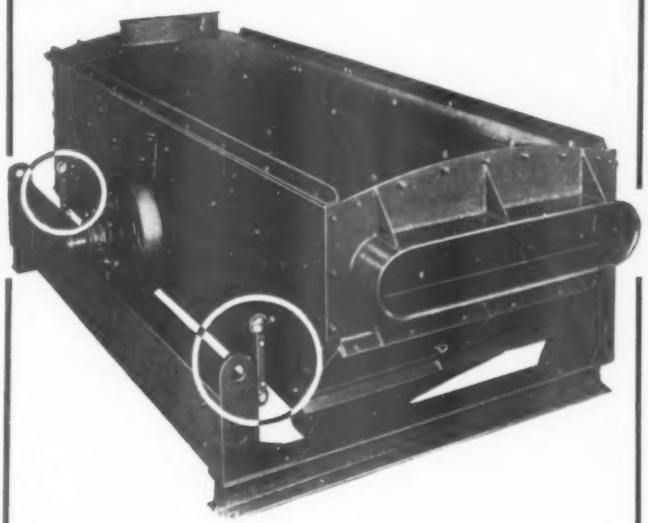

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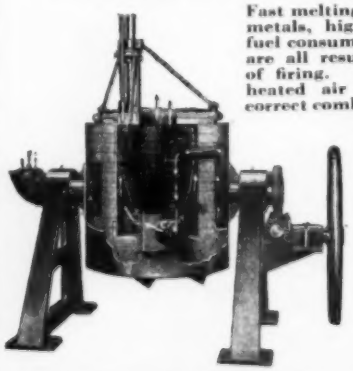

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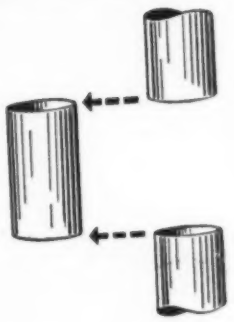
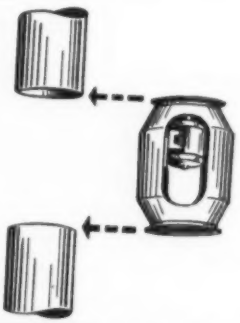
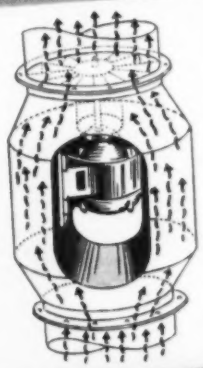


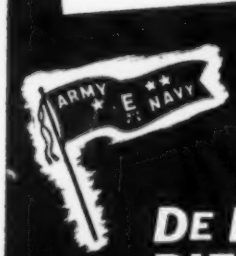
1. OUT COMES A SECTION OF DUCT OR STACK.



2. IN GOES A **BIFURCATOR.** NO PLATFORMS OR SUPPORTS NEEDED.



3. MOTOR IS **NOT** EXPOSED TO FUMES. AIR STREAM IS BY-PASSED AROUND ISOLATED MOTOR CHAMBER. AXIAL-FLO FAN WITH NON-OVERLOAD CHARACTERISTIC PROTECTS MOTOR AGAINST FAILURE.



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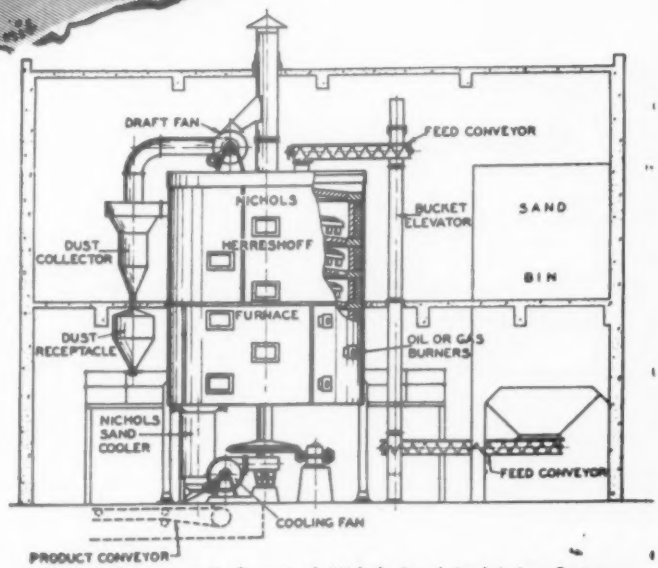

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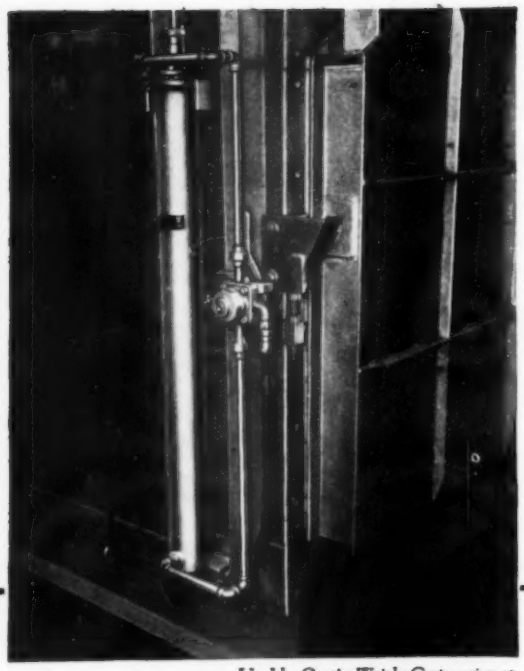

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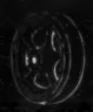

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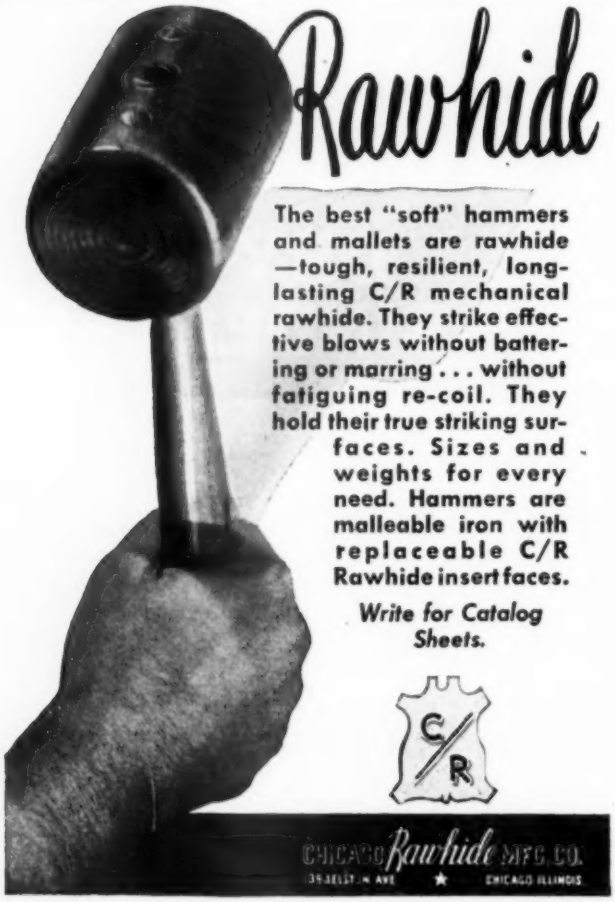

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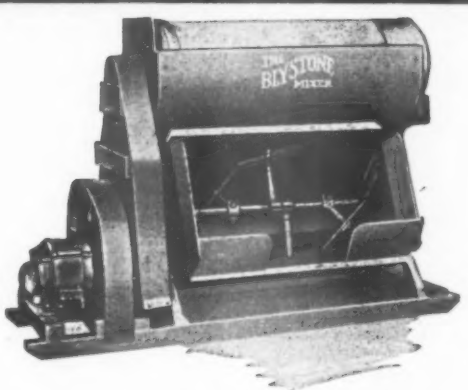

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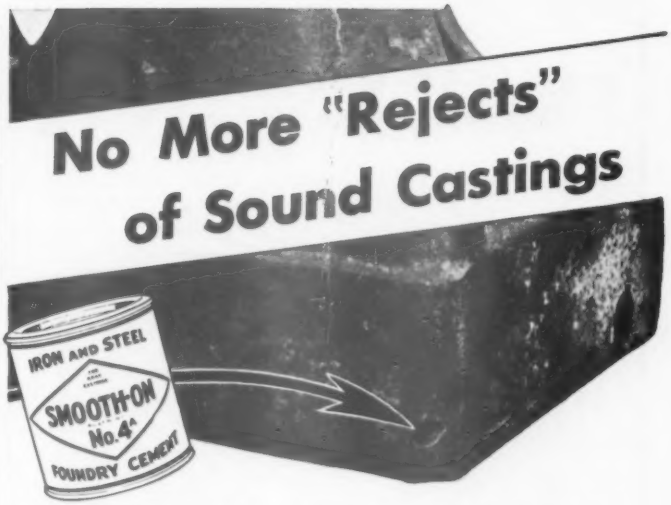

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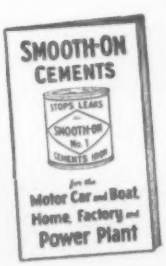

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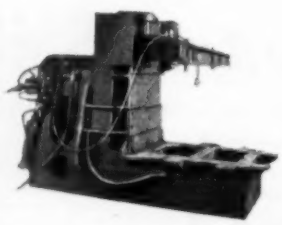

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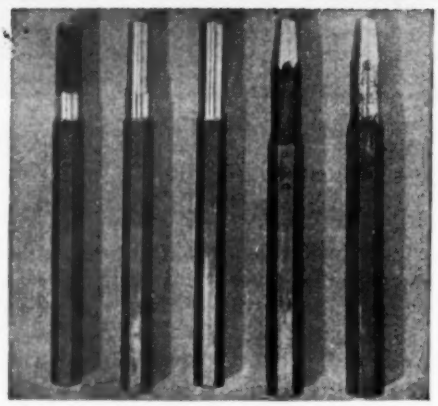

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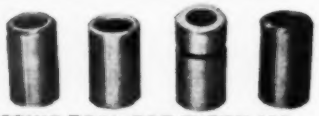

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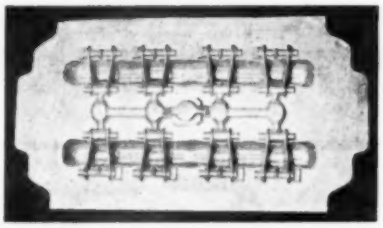

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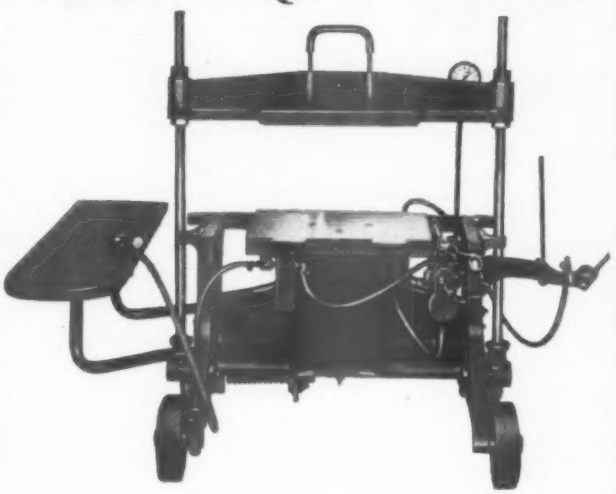

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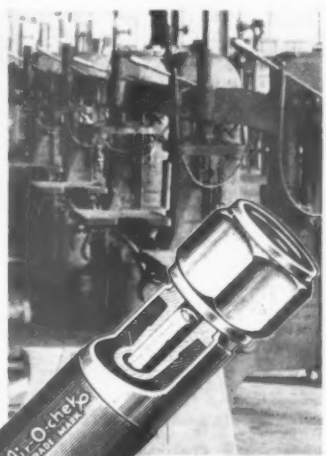

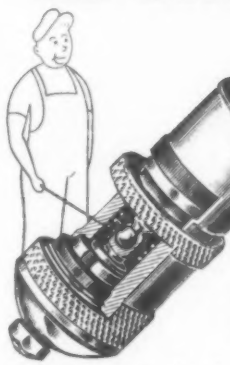

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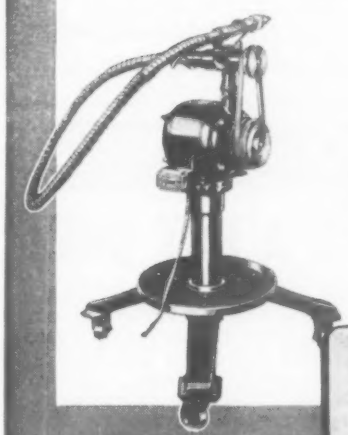

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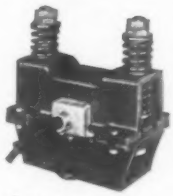

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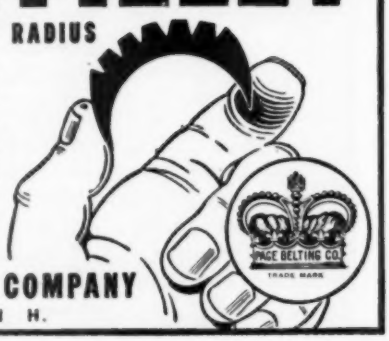

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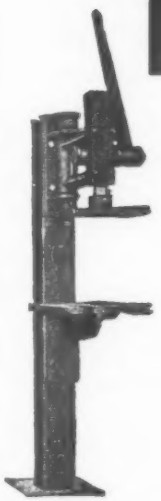

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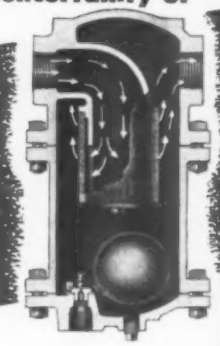

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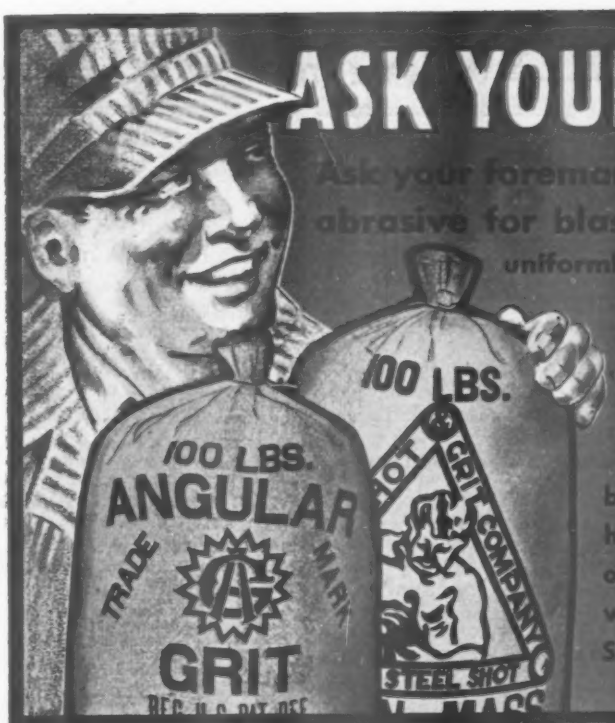

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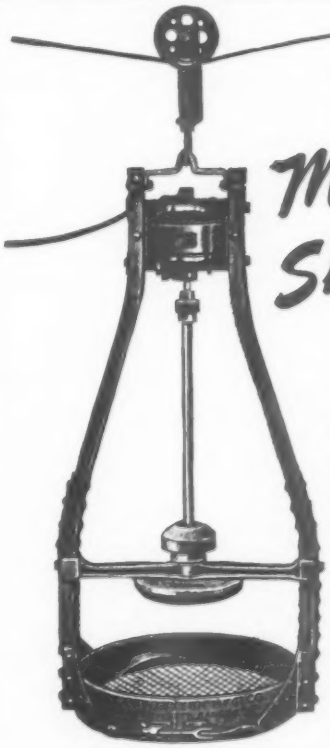

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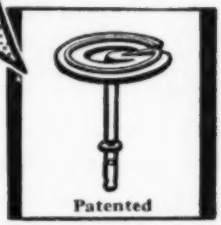

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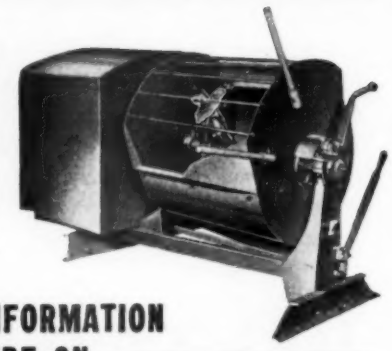

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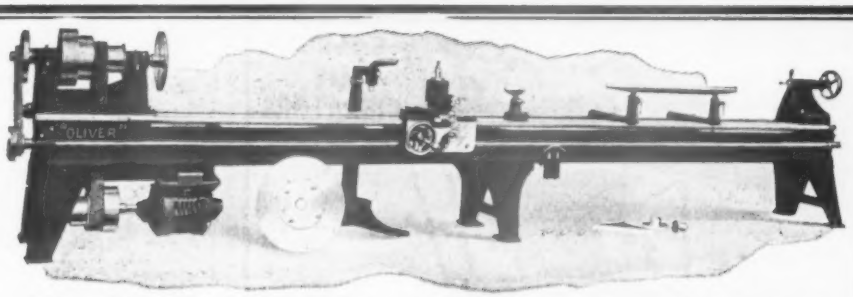

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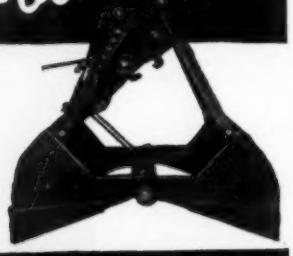

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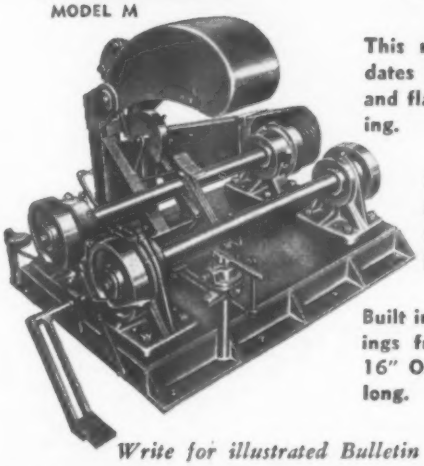

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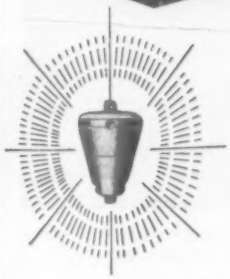

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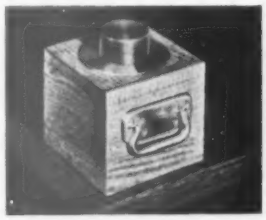

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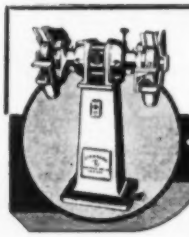

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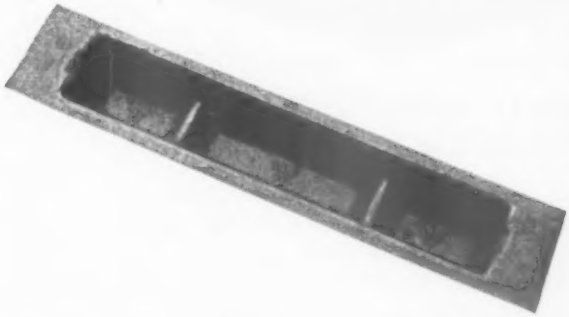

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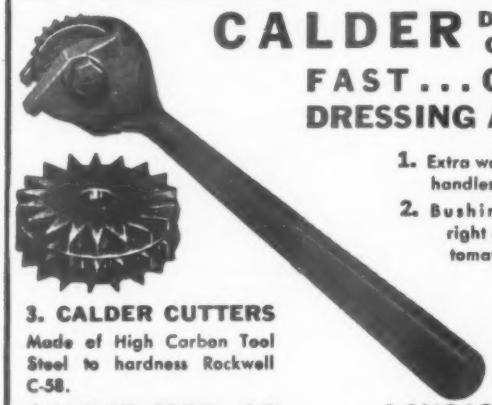

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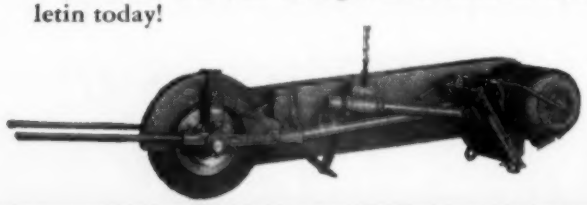

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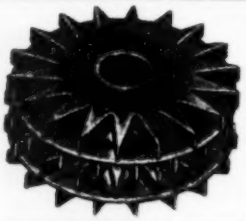

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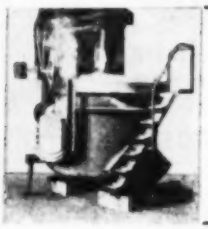

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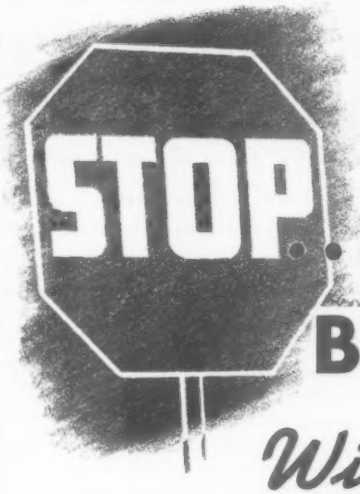

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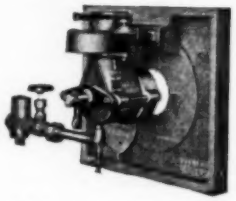

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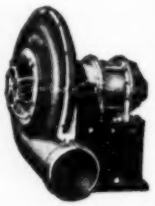

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Positions Wanted

HANDLE FOUNDRY SUPPLIES

Will handle complete line of foundry supplies and equipment Iowa and Nebraska territory, headquarters Omaha, Nebraska. Consider only the best. Must be substantial. Devote full time. Open office and warehouse. Former iron and nonferrous foundry sales manager. Sixteen years foundry experience. Thirty-eight years old. Welcome complete investigation. Best of References.

Box 713

The FOUNDRY Cleveland 13, Ohio

GOOD PEDDLER OF FOUNDRY EQUIPMENT AND SUPPLIES

Engineering graduate and practical foundryman, covering midwest from Chicago, can handle one or two additional lines to supplement present services. Address: Box 705, The FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

With long, valuable experience in managing, building up and maintaining foundry and machinery business on profitable basis, invites correspondence preliminary to interview. Ability to direct all office, sales, financial and production activities efficiently and economically unquestionably established by previous record. Address: Box 441, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Practical Foundry Executive and skilled metallurgist thoroughly experienced in both ferrous and nonferrous metals, large and small castings. Know all mixes. Can rig for production, estimating costs and sales engineering. Familiar with executive duties. Exceptional ability in handling labor. Good personality. Fine past record. Available at once. Address: Box 709, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

PRACTICAL FOUNDRYMAN

desires position with postwar future. Thirty years' experience as foreman and superintendent in iron, steel and magnesium. Successful background of proven ability. Capable of taking complete charge of either production or jobbing shop. Address: Box 695, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Desires a permanent position. Has years of managerial and practical shop experience both in molding and finishing of the product. Has a reputation for developing new methods and deas. Forty years of age, married and family. Address: Box 611, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT-METALLURGIST

Twenty-five years' experience in iron, steel and nonferrous metals including aluminum and magnesium, fully familiar with all phases of foundry operations wants to make new connection with reputable company, postwar future, preferably Eastern states. Age 47. Address: Box No. 684, The FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY MANAGER OR SUPERINTENDENT

Practical and technical, at present employed, but will be available the first of the year. Thirty years as foreman, superintendent and manager. Know heat treating and practical metallurgy. Am interested only in position where I can take complete charge of all foundry operations. Know how to handle men and good producer. Best of references. Address: Box 671, The FOUNDRY Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thirty-five years' experience both technical and practical training. Capable of taking complete charge of all foundry operations, both ferrous and nonferrous. Up to date on cupola practice, high strength and alloyed irons. Thirteen years in charge of aluminum and brass foundry. Expert on electric, gas and oil furnaces. Can estimate costs of castings from blue prints. At present employed as Foundry Superintendent. In position to go anywhere. Good connection more important than large salary. Captive foundry preferred. Address: Box 447, The FOUNDRY Cleveland 13, Ohio.

PERMANENT MOLD FOUNDRY CONSULTING ENGINEER

If it's permanent mold trouble you have, see me. Address: Box 688, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST-ENGINEER

College graduate, B.S. degree, age 27, 6 years' experience in nonferrous working and cold finishing industries including foundry, mill, development, supervision and administration. Desires permanent position with postwar future in metal industry. Address: Box 712, The FOUNDRY, Cleveland 13, Ohio.

COREROOM FOREMAN

For Brass and Aluminum Jobbing Foundry. Located in Northern Indiana. Definite postwar employment. Write giving age, qualifications, experience, marital and draft status, when available and salary expected. Address: Box 654, The FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

With broad background in iron and steel foundry products. Has the experience and ability, inspiring confidence and cooperation. Unusually successful in producing quality castings. Address: Box 699, The FOUNDRY, Cleveland 13, Ohio.

MACHINE SHOP SUPERINTENDENT

Eighteen years' experience in jobbing and high production shops with four years as first class machinist at Rock Island Arsenal. Age 41, married. Available immediately. Address: Box 718, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY CONSULTANT AND ENGINEER

A practical foundryman with many years experience in Gray Iron and Nonferrous Metals, Light, Medium and Heavy Castings. Understand foundry from Molding to Core Room, Grinding Room to Shipping, etc., A-1 foundry man. Now employed as superintendent and works manager. Address: Box 655, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY SUPERVISOR

Practical grey iron foundryman. Well trained for high class supervisory, technical and executive position in a grey iron foundry organization. Twenty-five years' broad experience producing quality castings, light, medium and heavy. Machine tool, engine, general jobbing and production. Well versed in cupola operation, metallurgy and foundry costs. Experienced with incentive system, sales, contact, expediting, personnel and foundry safety work. Neat appearing and pleasing personality. Middle age. Address: Box 648 The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-four years' wide experience as superintendent. Technical and practical training, medium and heavy high grade gray iron and semi-steel castings, green and dry sand. Well versed in metallurgy and best of cupola practice. Only interested in position where I can take complete charge of all foundry operations. Address: Box 715, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY CHIEF INSPECTOR

With two years' experience as chief inspector of aluminum and magnesium foundries employing 275 inspectors; eight years pattern making; and two years vendor contact, desires position with firm with good postwar future. Will go anywhere. Salary open. Now employed. Age 31 and married. Address: Box 690, The FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN OR SUPERINTENDENT

Employed, all-around practical foundryman and electric furnace operator, experienced in light and medium steel and bronze castings. Vast experience in gating, heading and rigging. Age 34, married, can handle all kinds of help. Address Box 658, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-five years' experience in rigging, labor and customer relations, purchasing, etc. Held same or equivalent position for past 15 years. Age 46. High school and two years' college education. Employed in grey iron foundry producing 500 tons per month. Prefer position in West or Midwest. Address: Box 670, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Available for the duration. Sixteen years' practical experience in white, gray, chilled, semi-steel and malleable iron. Exceptional experience in mixtures, furnace operations and reduction of foundry losses. Laboratory work not desired. Address: Box 686, The FOUNDRY, Cleveland 13, Ohio.

GOOD PEDDLER OF FOUNDRY EQUIPMENT AND SUPPLIES

Engineering graduate and practical foundryman, covering midwest from Chicago, can handle one or two additional lines to supplement present services. Address: Box 705, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT, GENERAL FOREMAN

Now employed, 25 years' executive experience in grey iron and semi-steel jobbing shops. Practical man on green and dry sand, medium and heavy. Well versed on high tensile metals, good cupola practice. Address: Box 708, The FOUNDRY, Cleveland 13, Ohio.

BRASS FOUNDRY SUPERINTENDENT

Twenty-five years' experience in nonferrous metals, light and heavy castings in practically all lines. Up-to-date in modern practice. At present employed but can make change in thirty days. Prefer New England. Married and beyond draft age. Address: Box 706, The FOUNDRY, Cleveland 13, Ohio.

COREROOM FOREMAN

Thirty-five years in the business. Experienced in both heavy and light work. Address: Box 720, The FOUNDRY, Cleveland 13, Ohio.

AGGRESSIVE SAND FOUNDRYMAN

Experienced as foreman and superintendent desires position with progressive firm doing high production and jobbing work with good postwar future. Eighteen years' experience; eleven for General Motors. Prefer aluminum but now gray iron and bronze. Excellent gater. Age 38. Address: Box 689, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Foundry for Sale

FOR SALE

Magnesium and aluminum foundry. This is an established and extremely profitable concern located in the St. Louis area.

Magnesium production exceeds 30,000 pounds per month. Aluminum approximately 15,000 pounds per month and capable of very great expansion.

Abundant labor supply—both skilled and unskilled.

Contracts on hand exceed three-quarters of a million and growing.

Complete operating and managing personnel well trained and on reasonable salaries.

Ill health of one partner and many diverse interests of the other make this sale advisable.

This is an extremely interesting proposition in view of the excellent postwar prospects of this shop.

BOX 668

THE FOUNDRY CLEVELAND 13, OHIO

Opportunities

BRADBRADLEY & FOSTER LTD., DARLASTON IRON WORKS, DARLASTON, STAFFS, ENGLAND, who have wide connections and associates in the iron foundry industry in Great Britain, are desirous of contacting U.S.A. manufacturers of foundry equipment and supplies interested in postwar exports to that country. Write direct to the address shown above.

OPPORTUNITY

We can furnish emp'y tight and slack wooden barrels, also steel drums for your products. ADDRESS: BUCKEYE COOPERAGE, STATION C.P.O. BOX 1501, CLEVELAND, OHIO.

Wanted-To-Buy

WANTED—TO LEASE OR BUY

Small Magnesium, Aluminum, or Nonferrous jobbing foundry in Michigan or Northern Ohio. Will also consider small steel foundry. Write giving full details, including price, terms, type of orders on hand and prospects for future business. Address: Box 722, The FOUNDRY, Cleveland, 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY Cleveland 13, Ohio.

WANTED

Used Tabor-abrasive cut off machine. Type C5AC or C7½AC, 220 Volt, 3 phase, 60 cycle, AC motor. Address: **AMERICAN MARINE BRASS FOUNDRY, 22 BERRIMAN ST., BROOKLYN 8, N. Y.**

WANTED

New or second-hand coal, sand and casting conveyors. Address: Box 679, The FOUNDRY Cleveland 13, Ohio.

WANTED

Compressor 500 to 1000 Cubic Feet per minute, must be in good condition, fairly new equipment preferred. Address: Box 704, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

3000—Steel Bands 2" wide for snap flasks sizes 12 x 14 to 14 x 28.

3—International Jolt-Squeeze molding Machines—Type PKL.

BOX 710

The FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

2 Used Paxson-Colliau Cupolas
1—58" diameter shell
1—42" diameter shell
also
1—Used Green Rotary Positive Pressure Blower size 15 made by Wilbraham-Green Blower Co.

FERRACUTE MACHINE CO.
BRIDGETON, N. J.

CENTRIFUGAL COMPRESSORS

7000 CFM, @ 1¼ lbs. pressure, Ingersoll-Rand type F S. driven by a 60 HP, Westinghouse 220/440 volt 3600 RPM motor.
2100 CFM @ 12 oz. General Electric with 10 HP 220/440 volt 3450 RPM motor.

Pressure Blowers

(2) 1200 CFM @ 11 oz. Buffalo, 9½" intake, 7" x 7¼" outlet, with 7½ HP 3/60/1800 RPM motors.

THE MOTOR REPAIR & MFG. CO.,
1552 HAMILTON AVE., CLEVELAND, OHIO

REBUILT USED EQUIPMENT

Molding machines, all types; tumbling mills furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 Lake St. Kalamazoo 21, Mich.

FOR SALE

ONE RANSOHOFF MILL

Side loading, side unloading tumbling mill with pump, tank, 2 HP motor and reversing switch. Mill is 48" long x 30" diameter and was used only short time. Reason for selling: Have outgrown its facilities. Priced right for quick sale.

GOULDS PUMPS, INC.
SENECA FALLS, N. Y.
ATTENTION: T. V. BALDWIN

AIR COMPRESSORS

BELTED—176 ft., 355 ft., 540 ft., 676 ft., 752 ft. & 1300 ft.
ELECTRIC—355 ft., 528 ft., 676 ft., 807 ft., 1302 ft., 1723 ft., 2022 ft., 2200 ft., 2800 ft., 3600 ft., & 5000 ft.

STEEL TANKS

9—5000 gal., 11,500 and 18,000 gal. cap.
17—1000 bbl., 4000 bbl. and 10,000 bbl. cap.

TANKS BOUGHT AND SOLD

R. C. STANHOPE, INC.
60 East 42nd St. New York, N. Y.

FOR SALE

WELDING, CUTTING EQUIPMENT. Torches, Regulators & Gauges, Aircraft Welding Outfits and Torches, Lead Welding Outfits and Torches, Soldering Outfits, Acetylene Generators, Supplies, Electric Arc Welders, Electrodes.

SUPERIOR OXY-ACETYLENE CO,
HAMILTON, OHIO

For Sale

FOR SALE

1—Type "R" International 14"x8" draw, hand roll, hand jolt, hand draw.
2—Type "R" International 22"x8" draw, hand roll, hand jolt, foot draw.
1—Type "R" International 24"x10" draw, hand operated.
1—Type "R" International 16"x8" rollover.
1—Type "PJS" International jolt squeezer.
12—Milwaukee jolt squeezers.
6—Milwaukee strippers.
1—No. 401 Osborn rollover.
1—No. 405 Osborn rollover.
2—Pridmore, 16"x6" draw.
1—Pridmore, 20"x8" draw.
1—Pridmore, 22"x8" draw.
1—Pridmore, 24"x8" draw.
6—Pridmore, Type "R" rollovers, 14", 16", 18", hand ram, hand roll, foot draw.
1—Herman rollover, 36"x45" table, air operated.
1—Herman plain air jolt, 30"x30" table.
14—Moline hand squeezers.
2—Tabor 20"x10" draw, jolt strippers, air jolt, air strip.
2—Tabor jolt squeezers.
1—Tabor plain bumper, 5' square table.
1—Tabor 24"x24"x10" draw, portable, hand ram, air roll, air draw.
1—Tabor plain bumper, 14" cyl., 30"x30" table
1—Nichols jolt strip squeezer.
2—Nichols jolt squeezers.
1—10x12 Ingersoll-Rand air compressor.
1—6x4 Ingersoll-Rand air compressor, motor and tank.
1—6x6 Curtis upright air compressor, motor and tank.
Ladles—all sizes.
1—24"x48"—1—1" shell, tumbling mill.
4—32"x32"x48" tumbling mills.
2—20"x56" tumbling mills.
1—30"x48" tumbling mill.
1—48"x48" tumbling mill.
2—Model AA sand cutters.
1—Beardsley & Piper sandslinger, used three months.
1—Beardsley & Piper sand conditioner.
1—Jeffrey sand conditioner.
1—No. 0 Simpson sand mixer.
1—Pangborn 6 ft. sand blast table.
1—International core blower, type SB-10.
High speed motor and blower for brass furnaces, several different sizes.
1—Stewart heat treat, complete with burners, 5 on each side.
4—2-ton Detroit air cable hoists.
1—5-ton Ingersoll-Rand air hoist, cable type.
1—Wire cutter—up to ¾" rods.
3—20" Combs electric riddles.
Speed reducers.
Rebuilt electric motors—all sizes.
Chipping hammers.
Assortment of new emery wheels.
50—Round aluminum flasks, 19" round, 6" cope, 3" drag, with two 4" pins.
Aluminum Pop-off flasks, as follows:
2—10x24" 7" cope, 4" drag (Hines)
1—12x24" 7" cope, 4" drag (Hines)
1—15x15" 8" cope, 7" drag (Hines)
1—14x18" 6" cope, 4" drag (Adams)
1—14x14" 5½" cope, 4" drag (Adams)

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 LAKE ST. KALAMAZOO 21, MICH.

REBUILT BLOWERS—FANS—EXHAUSTERS

Centrifugal blowers for gas and oil burning
Sand blast, grinder and dust exhausters
Roots-Connersville positive cupola blowers
Welding fume exhausters—Ventilating fans

GENERAL BLOWER CO.
408 NORTH PEORIA ST.
CHICAGO 22, ILL.

FOR SALE

Sly Sand Blast Rotary Table Model E $450.00. Address: Box 703, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Sixteen International Special Type GJ hand ram, power turnover, foot draw, molding machines; equipped with two 1" Branford vibrators on each machine. Will take corebox 24" wide, unlimited length. Precision built machines for close aircraft work. Good operating condition, priced to sell. **ALUMINUM CO. OF AMERICA, 3311 DUNN ROAD, DETROIT 11, MICHIGAN.**

Classified Advertising

For Sale

FOUNDRY EQUIPMENT FOR SALE

Moulding Machines
Knockout Machine
Sand Blast Cabinet, Large
Sand Blast Cabinets, Small, with Wet Collectors for Magnesium Castings
Furnaces
Steel Crucibles for Magnesium
Spot Welder
Air Presses
Paddle Type Mixer. Hot or Cold
Barrel Type Mixer
Abrasive cut off Machines—Two, one new

All items offered subject to prior sale, F.O.B. Detroit. Replies should be directed to the Corporation addressed 1400 Lafayette Building, Detroit, attention of Purchasing Dept.

BOHN ALUMINUM & BRASS CORPORATION
1400 Lafayette Building **Detroit 26, Mich.**

EQUIPMENT FOR SALE

2 Milwaukee Portable Jolt Strip Squeeze Machines, Type 113, Max. Patt. Draw 6" Max. Patt. Length 24", Max. Patt. Width 13½" Jolting Capacity 500 lbs., Platen Size 12" x 14".

1 International Manually Operated Strip Molding Machine, 36" Diam. Type W.

1 "Modern" 1 Ton Bottom Pour Worm Geared Crane Ladle.

12 Thor 001 Scaling & Chipping Hammers.

1 Bausch & Lomb—GSAM-IL9 Photomicroscope.

1 L & N Potentiometer with 2 point recorder.

2 L & N Controllers (non-indicating).

GREDE FOUNDRIES, INC.
P.O. BOX 443, MILWAUKEE 1, WIS.
TELEPHONE: MITCHELL 2450

FOR SALE

No. 79—72" Gardner Vertical motor driven disc grinder.

1—complete electric annealing furnace, 14 ft. wide 75 ft. long, A-1 condition.

Air compressors in stock, 100 ft. to 1500 cu. ft. Electric motors rebuilt, large stock.

Wm. C. Johnson & Sons Machinery Co.
1211 Hadley St.,
St. Louis, Mo.

FOR SALE

Hevi Duty electric furnaces (2) crucible type 350 lbs. capacity for holding aluminum with crucibles, transformer for 208 V., 60 cy., 3 ph. Have reservoir beneath melting chamber to collect charge in case of crucible failure. Brand new. Address: Box 538, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE
SPECIAL VICTORY BARGAINS
Cast Iron and Steel Plate Mill-Dust & Shavings Exhausters 50 in stock. **Cupola and Furnace** Blowers for Coke, Oil or Gas Combustion.
2—Sprague 4 Ton Electric Hoists 115 V. D.C.
MELTING FURNACES
2—Walker-York coke fired crucible furnaces for up to No. 70 crucibles—blowers attached
1—Pair Monarch-Rockwell's—Rotating, each 500 lbs. cap. mounted together on base, oil burners available, when used together waste heat from one preheats other.
1—Hausfeld open flame, non crucible 400 lbs brass capacity or equivalent volume for Aluminum.
1—Stationary for No. 70 crucible.
1—Booth Electric—725 Lb. Brass Capacity
Tumbling Mills:
1—Sly 48" x 60"—1" thick round steel shell
Core Ovens: Small portable, insulated.
1—8 ft. size No. 3 Simpson (Muller type) Sand Mixer.
Molding Machines:
2—Small plain jolt tables for core making.
1—Osborn No. 405 stationary, jolt-rollover-draw, 9" cylinders.
1—"Herman" 60" x 70" Plain Air Jolt Table 6000 lb. lift capacity.
1—Battenfeld stationary 12" cyl. plain squeeze
1—Arcade portable plain air squeeze 12" cyl.
1—Osborn No. 405 stationary jolt-rollover draw
1—Tabor all hand operated Portable 24" x 36" rollover, 8" draw.
Compressors:
Bury—12" x 10" modern valves—358' cap.
1—Chicago 12" x 8" 240' cap., 70 lbs.
Gardner 4½" x 4½" Vertical 19'.
Tested-air receivers—12" up to 36" dia.
1—Gardner-Rix. 8" x 6" twin vertical—140' displacement, 100 lbs. pressure, with 25 H.P. Motor, for 3/60/220 AC vee Belt Drive.

MAGNESIUM FOUNDRY DEP'T JUST DISCONTINUED, MANY FURNACES AND MUCH EQUIPMENT BEING DISPOSED OF, TELL US YOUR NEEDS.

CLIFTON MACHINERY CO.
1023 W. 6TH, CINCINNATI 3, OHIO

FOR SALE

A new unused No. 7 Whiting Cupola Skip Hoist complete with motor and automatic control. Will sell at a sacrifice. Address: Charles Parker Co., Meriden, Conn.

FOUNDRY SUPERINTENDENT-METALLURGIST

FOR SALE

For want of use, one Dust Arrestor from Tabor Cut-Off machine, also one Foot Power Sprue Cutter. Both articles new. Address: COCHRANE BRASS FOUNDRY, YORK, PA.

FOR SALE

Mold tester, moisture teller, sand compression strength tester, laboratory balance, permeability meter. All like new. Cheap. Address: Forse Corporation, Anderson, Indiana.

For Sale

REBUILT EQUIPMENT IN STOCK
IMMEDIATE SHIPMENT

(2)—¾" Cap. Power Sprue Cutters.
(1)—10" Tabor Post Type Squeezers.
(2)—Heavy duty double end U.S. Elec. Grinders, 440-V.-3-PH-60-CY. Cap. (2) 20 & 4" wheels.
(1)—Pangborn type G.D. size No. 3 Sand Blast Barrel.

ELECTRIC MONORAIL HOISTS

Cap.	Make	Current	Remarks
(2)—1	Euclid	115-VDC.	Single Speed
(3)—1	Shepard	230-VDC.	Var. Speed
(3)—2	Shepard	230-VDC.	Var. Speed
(3)—2	Shepard	230-VDC.	Two Motor
(1)—3	Shepard	220-VAC.	Two Motor
(1)—4	Shepard	230-VDC.	Two Motor

SPECIAL: 2—1-ton Shepard Hoists, arranged for stationary mounting, 7½-HP. motor, 220/440-VAC. Var. Speed separate controller, 32-ft. of cable, suitable for use as winches, car puller to operate furnace doors to elevator.

SPECIAL: 2—7-ton Shepards, Fl. or Cage Operated, 230-VDC. 20-HP. hoist motor, 28/70-FPM. 10-HP. trolley motor, 300/400-RPM. 40-ft. lift.

AIR COMPRESSOR

(1)—9 x 8 Chicago, N.S.B. cap. 178-CFM. @ 100 lbs. with 25-HP. 220/440-VAC. motor and control.

BUCKETS

(1)—¾-yd. Hayward Electric 220-VAC.
(2)—1½-yd. Hayward Electric 230-VDC.

OVERHEAD ELECTRIC TRAVELING CRANES

Tons	Make	Span	Current	Remarks
(1) 2	Shepard	30'11"	230-VDC.	FL.OP.
(1) 3	Shaw	30'0"	230-VDC.	FL.OP.
(1) 4	Shepard	30'11"	230-VDC.	FL.OP.
(1) 5	Niles	24'0"	220-VAC.	FL.OP.
(1) 5	Box	40'0"	A.C. or D.C.	CG.OP.
(1) 10	Bedford	48'0"	230-VDC.	CG.OP.
(1) 10	Whiting	80'0"	220/440/VAC	CG.OP.
(1) 15	Morgan	52'3"	230-VDC.	CG.OP.
(1) 20	Northern	64'0"	220-VAC.	CG.OP.

WE OWN AND HAVE ALL THIS EQUIPMENT IN STOCK, IT IS OFFERED REBUILT IN OUR LARGE MODERN PLANT AND FULLY GUARANTEED.

T. B. MACCABE CO. 4300 CLARISSA ST.
PHILADELPHIA 40, PENNA.

FOR SALE

2 No. 274J, and 10 No. 275JW JOLT SQUEEZE OSBORN MOLDING MACHINES. THESE ARE USED MACHINES IN GOOD CONDITION. WILL SELL AT $100.00 EACH. ADDRESS: THE FOREST CITY FOUNDRIES COMPANY, CLEVELAND, OHIO.

FOR SALE

Used single phase electric steel furnace, complete except for large transformers. Automatic electrode control, etc. Used 18 months. Can ship immediately. Price F.O.B. shipping point $3,000. Address: Box 707, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

One—#3½ Whiting Cupola, 48" shell, 42' high, with Buffalo Pressure Blower and direct connected BB dust proof motor, control gate and blast meter. Ready to ship. Address: Box 696, The FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED POSITIONS

This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY INC.
101 Delward Bldg. Buffalo, N. Y.

GRAY IRON FOUNDRY EMPLOYMENT

We are receiving many inquiries for superintendents, metallurgists and foremen. We shall be glad to hear from qualified men. No charge.

Gray Iron Founders' Society Inc.
1010 Public Square Building Cleveland, Ohio

SCULLY Reconditioned Foundry Equipment

★ ALL SCULLY EQUIPMENT IS REBUILT AND OVERHAULED IN OUR OWN MACHINE SHOP

MOLDING MACHINES

JOHNSTON & JENNINGS

Jolt Roll-Over Draw Machines

No. 610, 24 x 30" table, 600 lbs. cap. @ 80 lbs. press., 10" pattern draw.

No. 815, 30 x 40" table, 1200 lbs. cap. @ 80 lbs. press., 15" pattern draw.

No. 918, 40 x 48" table, 2000 lbs. cap. @ 80 lbs. press., 18" pattern draw.

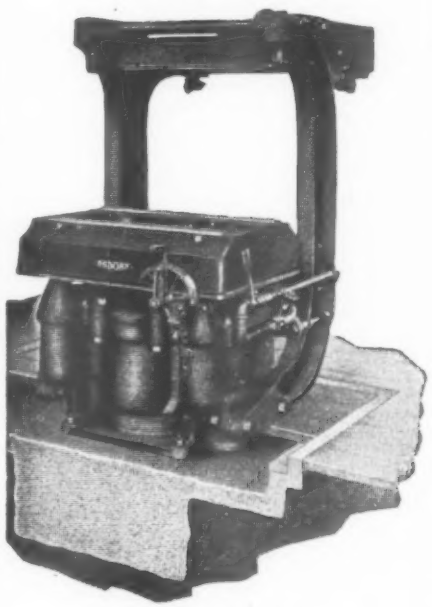
MISC. MOLDING MACHINES

No. 112 Arcade portable jolt roll-over and squeeze, pattern draw, table accommodates pattern plates up to 13 x 33"—9" draw, distance between uprights 36".

No. 24 Davenport—24 x 38" table 10" Pattern Draw 1000 lbs. capacity at 80 lbs. pressure.

Pridmore 30 x 42" power turn-over and drop Electrically operated 24 x 32" jarring machine, 2 HP 220V AC Motor.

OSBORN JOLT SQUEEZE & POWER STRIP



No. 703 OSBORN

(Similar to above excepting with roll-off)

No. 703-6 Osborn jolt squeeze and strip, 21 x 28" table, stationary. Length of opening in lifting frame 34", 6" pattern draw, 8" cyl. dia. 1000 lbs. jolting cap. @ 80 lbs. press. Distance from lifting frame to squeeze head 24¼", flask length 44½" with roll-off conveyor.

No. 703-5 Osborn, same as above, excepting 17 x 35" table.

PLAIN AIR SQUEEZERS

Tabor stationary, 32" between rods, 13" dia. cyl. 18 x 24" table.

Davenport, 33" between rods, portable straddle type, 10" cyl. 14 x 20" table.

Tabor, portable, 32" between rods, 10" dia. cyl. 16 x 17" table.

NOTICE

•Just a word to remind you that we BUY as well as sell foundry equipment items.

We will purchase your used items outright or list them for sale. For fast action in turning equipment into cash, take advantage of our many years of contact and dealings with foundries throughout the country!

—Ray P. Scully

PLAIN JARRING MACHINES

60 x 60" Tabor, 14" dia. cyl. 8500 lbs. cap. @ 80 lbs. press.

42 x 60" Tabor, 13" dia. cyl., 7500 lbs. cap. @ 80 lbs. press.

JOLT SQUEEZE STRIPPERS

No. 113 Milwaukee, open end type, portable, 500-lbs. cap. @ 80 lbs., 6" draw, 16 x 35" table.

Osborn No. 82 STRIPPING PLATE JOLT SQUEEZER, 46" between rods, 10" draw, 1200 lbs. jolting cap., 1000 lbs. stripping cap., 24 x 36" table pin lifts 12" part one way, 36" the other.

Nicholls Type "D" stationary heavy duty, JOLT SQUEEZE & PATTERN DRAW, squeeze piston 14", jolt piston 6", draw 2-6"—distance between strain rods 40" take approx. 15 x 24" flask.

JOLT STRIPPERS

International Type T.J. 30" x 30" with 10" draw.

Osborn 550-22 Pit type jolt strip fixed pin centers—16" x 32" table 32" x 36".

Osborn 550—Pit type fixed pin centers 16" x 26" table 17" x 36" capacity 750 lbs. 12" lift.

Osborn 560—Pit type adjustable pins—table 30" x 48".

ELECTRIC BUCKETS

2-Yd. Hayward Electric Bucket equipped with Shepard hoisting Unit 22 HP 3/60/440.

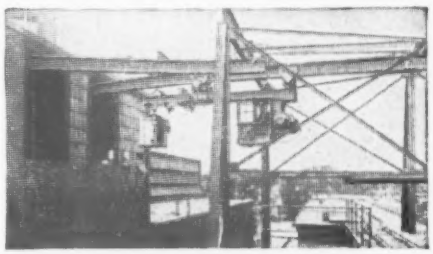
2-Yd. Hayward ELECTRIC BUCKET, equipped with SHEPARD Hoisting Unit, 10-22 H.P.

1½-Yd. Hayward Electric equipped with 230V DC Electro Dynamic Motor, Hoist Cap. 8000 lbs.—Class "B" 6 HP.

Whiting No. 7 Skip Hoist Cupola Charger complete with Skip Bucket and Housing Unit.

Jeffery Sand Conditioner Type P—Motor 220V 3/60 Cycle.

SHEPARD CHARGING CRANE



1—3-Ton Shepard Charging Crane, Cage operated. Hoist Motor, 20 HP, 3/60/220. Travel Motor 14 HP—Lift 30 feet.

OVERHEAD ELECTRIC TRAVELING CRANES

10-ton approx. 30'7" span, 3-motor type, Northern Electrical 115 V. DC Motors, Hoist 15 HP 750 RPM, Rack 3 HP 1200 RPM, Bridge 7½ HP 950 RPM, EC&M Controllers, cage oper., 24" double "I" Beams, cast iron truck ends, chain lifts.

10-Ton Whiting 57' approximate span—3 Motor 220 Volts DC Crane.

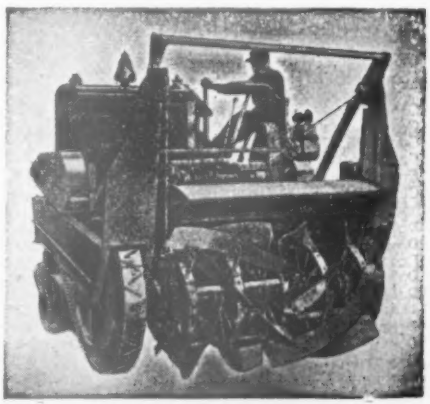
1-ton Detroit Type "H" Lohed Room, approx. 29 ft. span, 12" double "I" beam girders, 9 ft. lift, floor control Watson Induction Type "KH" 3/60/220 V. AC Motors, approx. 40" clearance.

3-ton MILWAUKEE 3-motor Type "C" GANTRY CRANE (suitable for 5-tons) 230 V. DC Motors, lattice type girders, structural end trucks, enclosed cage at one end, approx. span 31'6", lift 25 ft. overhang each side approx. 12 ft., single drum parallel with bridge girders, including ½ yd. single line perforated BUCKET for same.

AMERICAN SANDCUTTERS

Cleveland-American (similar to Model "K" 84" spiral cutting cyl., 36" dia., 92" between tractor wheels 5" face, 6' dia.—equipped with Cleveland 3-phase 60 cycle 220V AC Motors, Cable and Take-Up Reel.

American Model "CP" size 72, having 72" cutting cyl., 90" between tractor wheels, tractor wheels 50" dia., 5" face, equipped with Hercules Gas Engine.



SCULLY MACHINERY & EQUIPMENT CORP.

2031 WEST 74th STREET (Phone PROspect 8770) CHICAGO 36, ILLINOIS

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ELIMINATE DUST

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● Factory dust and dirt does more than any one single factor to slow up production, cause absenteeism, and deteriorate equipment and plant. This is a terrific penalty to pay for rampant dust which can be harnessed. A clean plant is a profitable plant and Parsons Oval Bag Dust Arrestors have for over a quarter of a century been mastering not only dust problems in all types of plants but in many cases actually paying for themselves.

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MODERN EQUIPMENT CO.
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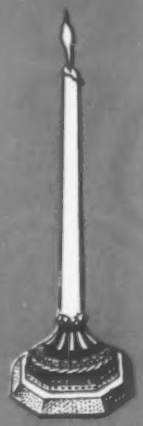
OPENING UP

A New Year



Christmas 1944

We Salute

foundrymen everywhere--as we begin our sixty-second year of continuous service to the foundry industry--and extend to you our sincere good wishes for a prosperous -- victorious

New Year

New Year 1945

FREDERIC B. STEVENS INCORPORATED

DETROIT • MICHIGAN

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• 2368 Dundas St. West . . . . Toronto Ontario

INGOT MOLD CONVEYORS

SPEED PIG CASTING of CRITICAL METALS

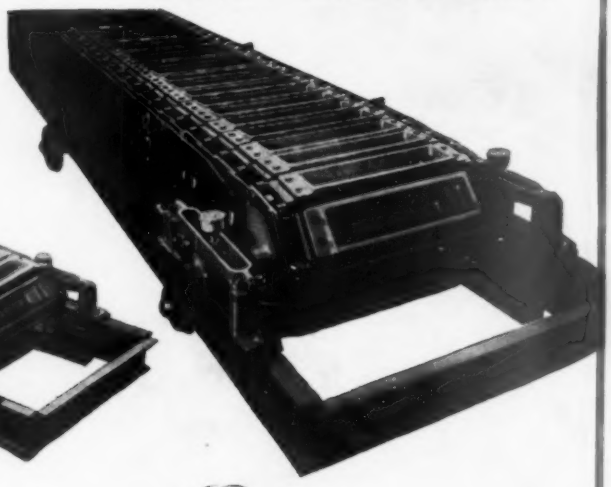
Section of horizontal run of conveyor showing pouring from one of five melting furnaces. The ingots are cooled on the conveyor, which travels at varying speeds to suit production, and are automatically discharged over head end of conveyor.

Self Contained Units Put Pouring an Cooling of Brass, Lead, Aluminum an Magnesium Ingots on a Continuous Basi

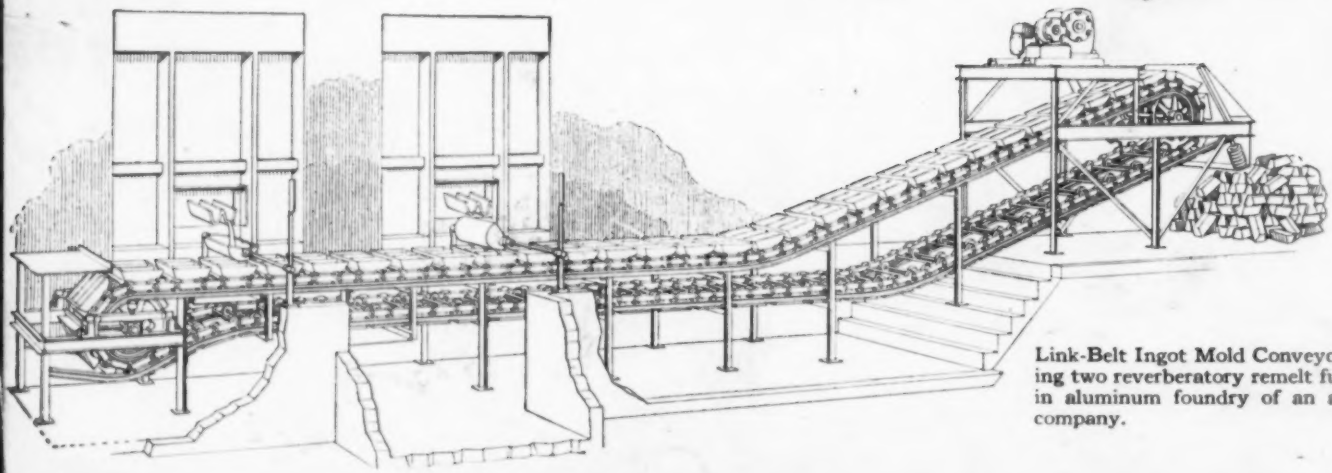
Hand lifting and carrying of ladles to and fro molds is eliminated by these Link-Belt conve yo units, which carry the molds through the pou ing operation. More uniform ingots are cas with pouring, cooling and discharge made continuous operation. Made in various desig and capacities to produce practically any si ingot and to handle as low as 1,000 lbs. per hou of aluminum and up to 20,000 lbs. per hou Conveyors can be applied to serve one or series of furnaces, and arranged with eith automatic or manual pouring devices.

LINK-BELT COMPANY

Chicago 9 Philadelphia 40 Indianapolis 6 Atlanta (Dalla
Minneapolis 5 San Francisco 24 Toronto 8



Two views of a Link-Belt Ingot Mold Conveyor for lead. This is a portable, self-contained unit with molds of malleable iron, carried on "SS" type steel roller chain.



Link-Belt Ingot Mold Conveyor serving two reverberatory remelt furnaces in aluminum foundry of an aircraft company.

LINK-BELT CONVEYORS